

Contractors and Engineers Monthly

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PICKS and SHOVELS

By O. E. POTTER

Construction Is No Circus

"Construction Ahead" seems to cast over people the same kind of spell as a circus announcement of the "most gigantic, stupendous, colossal show on earth." Wherever contractors and equipment are gathered together for the serious purpose of carrying on construction, there also is the inevitable group of on-lookers who seem unable to tear themselves away from the fascinating sight of a power shovel methodically removing dirt and rock, or a crane swinging steel beams into place.

The Project Engineer for a new railroad overpass on a main highway in Indiana will probably have many more gray hairs when the job is over than he had when it started, not because of the difficulties of the job itself, which ran smoothly enough, but because of the nuisance of curious and wondering school children who made up a daily audience.

S. R. O. on Old Bridge

There was an old narrow steel truss bridge, running parallel to the new work and only about 20 feet away, on which there were no sidewalks. The majority of the children attending a nearby grade school had to pass over the old bridge on their way to and from school, and fascinated by the work under way, they accordingly loitered in order to watch proceedings. Invariably they fooled around, pushing and shoving each other, laughing and giggling and shouting, and bad accidents were avoided only by a miracle.

Traffic over the old bridge was heavy and the danger of accidents to the children by cars worried the Project Engineer considerably.

No Aid from School

He went to the school authorities and asked their aid. Some remarks were made to the classes but to no avail. No school patrol was organized to police (Continued on page 11)

Skilled Laborers Hit by Relief Labor

County Labor Agencies Must Be Discarded for Freer Selection

By CHARLES B. COCHRAN,
Dungey & Cochran Construction Co.,
Marion, Ill.

THERE are certain phases of the labor regulations for Public Works projects which are practical and well founded. Specific wage scales with minimum limits are quite acceptable for leveling the wage increment; control of payrolls receives no objections. No legitimate contractor has anything to hide, and these payroll reports are a protection to him as well as to the employees. But employment agencies and the mandatory selection of labor through these agencies strike at the very heart of the construction industry. If employment agencies are necessary to the political mind, their powers must be curbed to a point where they will not actually crucify the contractor.

"I'm Skilled" Means Nothing

It is absurd to assume that efficient labor can be obtained from unemployment lists, when these lists are confined to the limits of the county or the immediate vicinity in which the specific project to be built is located. The average employment agency is not qualified to select labor for an industry about which it knows nothing. The fact that a man applies at a relief agency, fills out a card, and registers himself as a skilled laborer, does not make him one, irrespective of the amount of insistence on his part or the agency's.

The contractor today wishes to select his own labor and build up his own organization without interference from outside sources. If allowed to do this he is willing to confine his selection to

Louisiana Contractor Laid Stable Clay Fill for Bridge Approach

Southwest and Midwest Contractors Optimistic

There is a distinct feeling of optimism among contractors in the southwest and midwest states which I have recently visited on a two-months trip by automobile, inspecting more than 75 construction projects. Contractors feel that the extended Public Works Program means stability in the industry and have given evidence of their optimism through the purchase of a considerable amount of new heavy equipment.

General business conditions as evidenced by the fewer numbers of laborers available for construction operations from re-employment agencies seemed best in Texas but were generally improved in all of the states visited, which also included Oklahoma, Kansas, Missouri, Nebraska, Iowa, Illinois, Indiana, Ohio and Pennsylvania.

Theodore Reed Kendall,
Editor.

the State in which he is operating, and in so doing, unemployment, national recovery and the contractor will all benefit.

Hypothetical Case—A True Picture

The State is the political unit for the administration of unemployment relief. With this in mind it is difficult to differ- (Continued on page 20)

Well-Compacted Fill, Relief Opening Trestle Features of La. Contract of Robinson & Young

(Photo on page 44)

THE ambition of every grading contractor is to produce embankment fills that won't settle, that show minimum shrinkage, and which can be paved immediately. This hope was fulfilled on a new approach to the Calcasieu River Bridge on State Route 42 connecting the two largest cities of their sections of Louisiana, Lake Charles in the southwest and Shreveport, in the northwest.

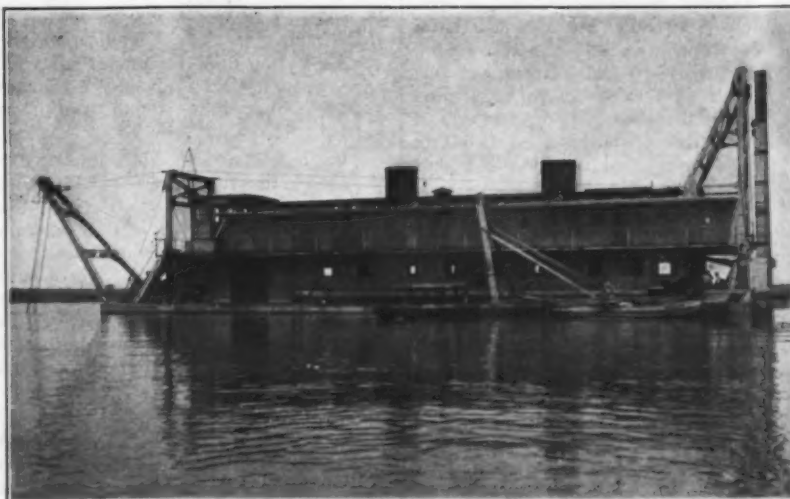
The Calcasieu River bridge, a vertical lift span, was built in 1924 with creosote pile approaches. The highway carries heavy traffic but was out of commission two months a year because of high water in the river which loops about the southern approach. Routine examination of the Oregon fir deck of the approaches showed that they could not be turned over and used again as had been expected and also that the caps of the bents had become structurally unsound in 10 years, in spite of creosoting. The trouble was dry rot, showing that probably the penetration of the creosoting of the initial caps was not sufficient.

It was decided that, while the bridge was not in use during the repairing of the bents and deck, it would be well to raise the south approach a maximum of 11 feet and carry it back to the existing grade, a distance of 5,600 feet. In addition a relief opening near the center of the fill, 800 feet long and involving another new trestle, was included in the contract, which was awarded to Robinson & Young of Baton Rouge, La., on May 3, 1934, for \$77,693.32 with an allowance of 200 working days. The work which was started May 18, 1934, was completed in March, 1935.

Operating the Borrow Pit

The contractor opened a 5-acre borrow pit about 1/8-mile from the south end of the job, giving him an average haul of about 0.7-mile for the embankment material. The pit was started with a 5/8-yard General Excavator shovel equipped with a 40-hp Buda motor loading to a fleet of ten 1 1/2-yard trucks; five Fords, three Chevrolets and two Internationals. The material was a good red clay similar to brick clay. The shovel worked in the pit until it had developed a 5-foot face and then the unit was converted to a dragline with a 42-foot boom and a 3/4-yard Yaun dragline bucket. The dragline, which was run on top of the bank and the trucks below, permitting fast loading with a minimum of shifting of the (Continued on page 15)

DREDGE MANATEE DESIGNED BY A CONTRACTOR



The Manatee at Work on the Wilbanks & Pierce Highway Fill Contract Which Was Described in the May Issue. See Page 12 of This Issue for a Complete Description of the Dredge.

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Ingenious Methods Used in Driving Baltimore Tunnel

CONTINUING its gigantic program of electrification of its main lines from New York to Washington, D. C., the Pennsylvania Railroad started the driving of the new Union Tunnel beneath the streets and houses of Baltimore in the late summer of 1933. The existing tunnel was all too small to permit electrification and so a contract was awarded to the Arundel Corp. of Baltimore for a 3,330-foot project, consisting of 950 feet of open cut at one end, 2,085 feet of shield-driven tunnel, the subject of this article, and 295 feet of open cut at the other end. As a matter of convenience, the 950-foot open cut end was referred to as the Washington end of the job, and the other as the Philadelphia end.

The features of the tunnel contract have been: the use of side drifts for the construction of the side walls on which the cast iron lining of the semi-circular main tunnel was set by a hydraulic erector without a counterweight; the methods of mucking; and the handling of the concrete by truck mixers, side-delivery hoppers mounted on standard-gage cars in the tunnel, and concrete pump delivering through pipes in well holes.

Initial Work

The initial work on this contract was on the Washington end open cut, which was started in July, 1933. The 2,085-foot tunnel section was driven from a single shaft at Valley Street from the Washington end toward the Philadelphia end of the tunnel. The Valley Street shaft was 48 feet square, 54 feet deep and was excavated in August and September, 1933. The side-wall drifts were started October 23, 1933, and the main shield started on its journey January 15, 1934. The shield started in decomposed gneiss overlaying a hard hornblend gneiss but there was always some clay in the heading, some sand and a little water-bearing strata in the bottom of the drifts. These water-bearing strata were low in height and never more than 3 feet above grade. At times the tunnel proper ran into a full sand and clay face and at no time did the rock run more than half-way up the face.

The tunnel is on a 1.2 per cent grade, giving natural drainage throughout the work. Two 10-inch Poroswall pipe lines were laid 5 feet on either side of the center line in the tunnel and 8 feet either side of the center line in the open cuts for permanent drainage.

The Side-Wall Drifts

The driving of a semi-circular shield for the main tunnel brought up the problem of carrying the weight of the shield during driving. Several methods were considered. It was finally determined to drive two pioneer or side drifts, pour the footing and short side wall in the drift, leaving sufficient room to muck by the wall, and then support the roof shield on the walls. The side drifts were kept far enough ahead of the main tunnel to permit the concrete in the footing and side walls to have at least thirty days curing before carrying the shield for the main tunnel on rails set on top of the walls.

The side-wall drifts were driven 11-foot in diameter with full circular shields and progressed from 4 to 7 feet per day in rock and as high as 12 to 16 feet per day during April and May, 1934, when driving through sand, clay and gravel. The side drifts were temporarily lined with Truscon liner plates

Pioneer Side Drifts, Semi-Circular Shield, Mucking and Concreting Features of Arundel Job

3/16-inch thick and paneled for strength. There were eleven plates for the full circle, each being 3.1416 feet long and 16 inches wide. Where the ground was good, the miners poled ahead for two shoves and the erection of two rings as soon as the drift was mucked out and before further excavation was started. The struts to carry the thrust of the hydraulic jacks were usually carried back four or five rings.

The hydraulic equipment for the

2 feet 9 inches long. Each segment, except D and K, had five holes for 1 3/4-inch bolts at each end and holes for six 1 3/4-inch bolts along the side for bolting to the adjacent ring. Segment D had only three instead of six bolts for attaching to the adjacent ring and Segment K only one bolt. Each segment had one 3-inch grout hole threaded for pressure grouting around the outside of the metal sections of the tunnel.

An Ingersoll-Rand air wrench was used for setting the segment bolts which were tightened to final set against two hemp rope grummets impregnated with red lead by a 4-foot hand ratchet wrench operated by two men. The caulking slot between the segments was 1/4-inch wide and 1 inch deep. Into this 5/16 x 1/2-inch and 3/16 x 1/2-inch lead was caulked by pneumatic tools.

The Main Tunnel Shield

The main shield, 36 feet 1/4-inch in diameter, was equipped with twenty 200-ton hydraulic jacks operating under 5,000 pounds per square inch pressure. The shield carried eight tables, three above and five below, the bottom center table having two jacks, because a single

jack could not be centered at this point where the hydraulic erector was stalled.

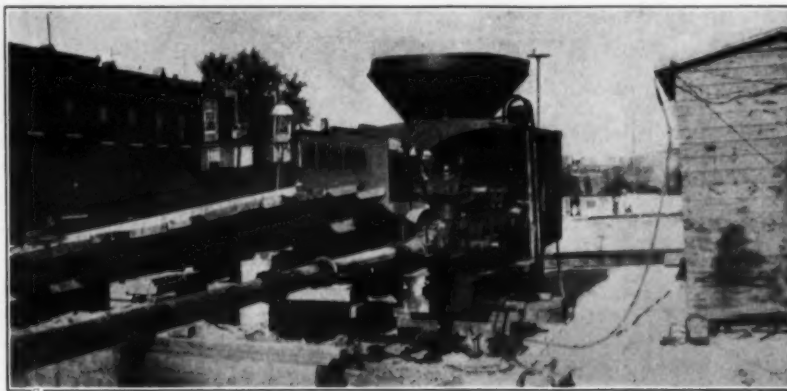
The shield was built with a short table which covered the last ring only 1 1/2 inches after a 30-inch shove. On a good face, 8 x 8-inch soldiers with 2 x 10 inch face boards were used. The excavation from the face ran 27 cubic yards per linear foot. On the shield, there were eight miners, with eight helpers and five shield muckers with one shield driver for each shift. As the main shield advanced, the top two or three liner plates of the side tunnels were removed.

The hydraulic erector was of special design, adapted for use in a shield of semi-circular section. Since excavation extended only a few feet below the center line of the shield, it was impossible to use any counterweight on the erector arm. The erector and the control for the erector was therefore redesigned by the Watson-Stillman Co. and proved successful. The erector handled with accuracy and safety segments weighing 2,500 pounds at a radius of 17 feet with full control circumferentially and radially. The erector was used at one point to handle a 2-ton jack at its full extension of 17 feet.

The shield pulled a trailing platform which carried a Union Iron Works pressure grouting machine which was used to grout after the placing of each ring. An accelerator was used with the grout so that it would set up against the header quickly, and not delay the placing of the next ring. There were three of these grouting machines on the job, one for each drift and one for the main tunnel. Each machine handled 1 cubic foot of grout per charge, using the full line pressure of 100 pounds of air for placing. No gravel packing was used around the rings.

Hydraulic Power Equipment

The hydraulic power pumps, accumulator and one of the air compressors (Continued on page 8)



C. & E. M. Photo
The Pumpcrete Unit Which Delivered Concrete Through Well Holes to the Side Drifts.

small circular shields consisted of eight 62-ton Watson-Stillman double-acting shield jacks with complete control valves for each of the two side drift shields. Each jack was fitted with a long self-aligning ram head, for equalizing the pressure on the liner plate flanges.

There were two miners, two helpers and four muckers for each drift. The muck was loaded by hand to industrial railway side-dump cars and hauled back along the drift to the shaft where the cars were raised one at a time by the electric elevator and dumped directly into a large hopper from which heavy-duty trucks were loaded to capacity, hauling the muck to a dump.

The Main Tunnel

The inside diameter of the finished iron in the main tunnel is 33 feet at the spring line. The cast iron section is semi-circular with one 2-foot 9-inch tangent segment at the bottom on each side resting on the 8-foot 9-inch high concrete side wall. The distance from the top of the wall to the top of the tunnel invert is 6 feet. The invert was poured 2 feet thick in rock sections and 2 feet 6 inches thick in earth. The cast iron lining consisted of two sets of rings, designated as Ring R-1 and R-2, which were placed alternately. Ring R-1 consisted of the following segments: two "A", six "B", two "D", and one "K". Ring R-2 was made up of: two A, five B, two C, and one K. All segments were 30 inches wide, with 14-inch flanges and 1 1/2-inch walls. Segments A and B measured 78.858 inches long and were identical, except that Segment A had a non-radial face to permit the insertion of the inverted key segment K at the top. This key segment was 13.143 inches long. Segment C measured 2 feet 9 inches along the tangent and 39.429 inches on the arc, or a total of 72.429 inches. Segment D, the end tangent section, was

Excavation—Wet and Dry

Livingstone Channel of the Detroit River Cleared with Dynamite to 28-foot Depth

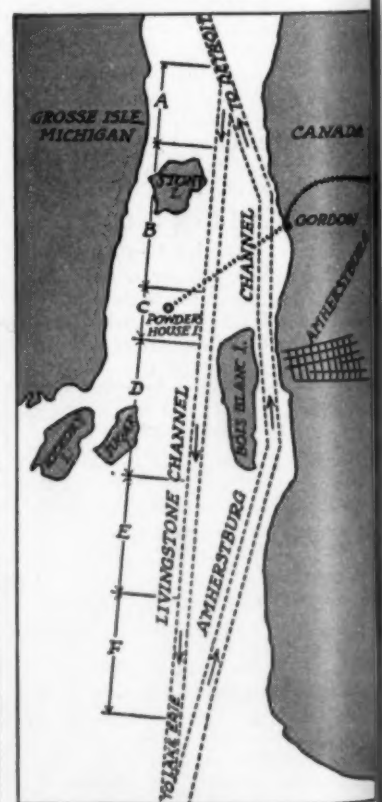
IMPROVING the Detroit River, Michigan, to take care of navigation is nothing new. As early as 1877 the first work of this kind was undertaken. Up to the time of the World War, the Livingstone Channel for southbound ships and the old Amherstburg Channel represented an expenditure of more than \$10,000,000. The first project called for a channel 600 feet wide, 21 and 22 feet deep; the second, for a minimum width of 300 feet and a depth of 22 feet, except in the area, now called Section B, where more width was required.

Between 1918 and 1925 other sections of the Livingstone Channel were widened, but within a few years it became apparent that more depth would be needed.

The importance of this water way is shown by the fact that in 1933 cargo more than three and a half times the tonnage carried through the Panama Canal and considerably more than twice the total reported for the Suez Canal in that year was carried through the bottle-neck of the Detroit River. In 1929, the banner year, more than 110,719,000 tons of coal, iron ore, wheat, pig iron, limestone and other bulk commodities were transported.

On May 5, 1932, bids were received by the U. S. Bureau of Engineers for the further improvement of this channel at a point starting about 9 miles below Detroit and extending into Lake Erie. The accompanying sketch shows the

location of the area, a distance of about 32,500 feet. The work involved excavating 2,687,400 cubic yards of earth and rock to make the channel 450 feet wide at the bottom and to insure a minimum depth of 28 feet in the water way. (Continued on page 24)



A-C-F—Excavated in the Wet
B-D-E—Excavated in the Dry

Aerial camera "shoots" NEW YORK CITY'S newest TEXACO ASPHALT pavement



Bay Street in the Borough of Richmond, New York City, sees plenty of hard service, as the photograph plainly indicates. A rough-riding, noisy cobblestone pavement last year, it is now smooth and resilient through resurfacing with TEXACO Asphaltic Concrete.

With this project, New York City raises to 2,000,000 square yards the TEXACO Asphalt paving laid on its streets during the past quarter-century.

Back of this impressive showing in America's leading city will be found among other things a close cooperation with contractors. All TEXACO employees are well schooled in the importance of perfect teamwork with contractors' organizations on TEXACO road and street projects.



THE TEXAS COMPANY

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Philadelphia
Richmond
Boston
Jacksonville



Air view taken during resurfacing of old cobblestone pavement on Bay Street, Borough of Richmond, New York City, with TEXACO Asphaltic Concrete



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Profit, Prices and Equipment

"Sorry we are not running this afternoon, but the boom cable snapped this morning and just missed a man in the mud. We thought it would last until noon anyway," said the Superintendent in explaining the fact that on the second fine day in two weeks his concrete paving crew was laid off.

"We were going fine until the drive gave way on the grader last night and we can't get another 'til tomorrow," reported another contractor. And a third in as many days bemoaned the fact that his trucks were dropping out continually with one trouble after another.

What is the explanation? Inquiries brought out the fact that the paver had long since earned its way clear and should have been in the junk heap two years ago. Why didn't the contractor put it there and buy another?

"Bidding is so close these days that if you can make an old piece of equipment hold on a year or so longer until things pick up, you can bid in the jobs a little lower because you have nothing to charge off on the paver," was the candid answer of the Superintendent.

The continued lost time on that particular job, which was bid very close, too close,—practically cost the contractor every cent of profit and allowed him nothing to pay for moving the machines back to his own state. Perhaps he will leave the paver there, let it rust and then buy a new one for the next job. The contractor's answer to that is that the jobs are not long enough or numerous enough and he cannot get enough to make his required payments in the first year. He will find that before the end of this construction season the man who has the new equipment will be on top and he will have lost out because he worked his machines far beyond their economic life.

Bidding low on the strength of the fact that the machine owes the contractor nothing reminds me of the story told by the son of one of the big old-time printers in New York City. One of the Big Five found that his presses could handle a little more work without increasing his overhead and with very little cost for operation. His regular business was carrying all the overhead and operating costs of the plant so why not get that additional profitable business. He went out and gathered in some business at very low rates from customers of a couple of his competitors and was sitting pretty until one of the other printers discovered the same idea and

Handling Hand Tools

Some practical suggestions for handling some of the common hand tools was made recently in *The Safe Worker*.

The handle of a pick should be smooth and securely fastened so the head can not fly off. When using a pick always make sure there is no one in back or in front close enough to be struck. Have a firm footing and avoid swinging the pick too close to your

acted on it. But he took some of the old regular backbone business from the first house. Then another plant which had lost to both the first plants decided it would be necessary to cut its prices a bit to retain its business and to get some new accounts.

Thus the vicious cycle went on until they waked up to the idea that they had done nothing more than present their customers with lower prices and ruin their own business. Try substituting contractor for printer and you will find a close simile to conditions in the construction industry today.

Choose Your Cements for the Service You Want

Just as an engineer can choose steel of varied characteristics and tensile strength, depending upon the service to be made of it, he can now specify similarly the type of cement to suit conditions. There is a marked trend in this country away from the use of one standard type of cement for all construction projects. P. H. Bates of the U. S. Bureau of Standards pointed out in his paper before the American Concrete Institute in February that consumers are demanding more types and more varieties of cement within any one type of cement to meet the requirements of special construction projects.

There is a standard portland cement used in the majority of cases which is covered by the A.S.T.M. and Federal specifications; there are low-heat-of-hardening cements, such as are being used for Hoover Dam; there is portland cement to resist sea water and other waters containing destructive salts; and the high-early-strength cements used by almost every state highway department and many municipalities.

The increasing use of these cements is bound to result in better concrete. The project on which the cement is to be used must be carefully studied to determine whether a saving will result from the use of a special cement which will cost more than the standard portland cement but which may speed up construction, make possible a lighter structure, or lengthen the life of the structure.

Mr. Bates called attention to a large concrete bridge recently completed in France in which a high-early-strength cement was used because the designer found from tests that by so doing, he could use lighter sections than if he employed the cheaper but lower testing portland cement, which resulted in the higher-priced cement yielding the lower cost bridge.

feet,—or too far away. When you are through with the tool, put it away where it can do no harm.

When picking up or putting down a cross-cut saw, keep the teeth pointing away from you. Carry it on your shoulder the same way. Walk carefully and keep an eye out for anyone who might be close at hand. Do not turn corners fast. When through with the saw put it away on a rack flat against the wall, set so that it can't be knocked off.

Practice of Charge for Plans Unsatisfactory but Necessary

To the Editor
Contractors and Engineers Monthly

We have not made charges for plans and specifications until recently but on the last three jobs have asked for deposits and have refunded all but four or five dollars upon return of the plans. This is just about the actual cost of furnishing them.

We do not like this and think that the proper method is for the city (or owner) to furnish plans without cost. They must require a deposit in order to have them returned. The difficulty with this method at the present time is that there is a very large demand for plans, often from contractors and others who do not bid. The cities can not restrict the distribution of such plans and we think the practice of making charges has been brought about in an effort to avoid the distribution of plans not ordinarily needed.

We always make plans available at offices such as Dodge Reports and the Illinois Architects Construction Service, and we furnish considerable information on specialties or equipment items to those interested and furnish them lists of contractors so that they may quote them.

The proper solution of this problem seems to depend on the cooperation of engineers, contractors, and material men.

J. J. Woltmann
CONSULTING ENGINEER

Bloomington, Ill.
May, 1935

Other Engineers Uphold Charges for Bids

To the Editor
Contractors and Engineers Monthly

With reference to our own work, which has been in the past several years PWA, and since the established engineering fee to the client has remained unchanged, we find that for jobs under \$50,000 we are compelled to charge for plans and specifications if taken out.

Recently we had a job which aggregated \$30,000. Nineteen contractors took out plans and specifications. Besides this number we had to furnish five sets to PWA state and city officials. On letting the contract to the several low bidders, it was necessary to furnish an additional four complete sets and six copies of bond, proposal, etc., for each contractor, to the PWA.

At the current price of blue printing in Chicago under the NRA and as our specifications average 130 to 150 pages, you will agree if the engineer is to assume this cost on these small jobs there is nothing left.

We have our plans and specifications on file in the City Clerk's office of the city interested, and in our own office. Every contractor is invited to inspect the plans and specifications at either place and determine if he wishes to bid. If the plans are taken out, we assume that he is interested. When he has taken out the plans, they are of no further value to us, and the return of these is of no value, as the successful bidders never use over one additional set of plans and specifications. We therefore have fixed an unreturnable charge for plans and specifications on jobs under \$50,000.

Charles De Leuw & Company
CONSULTING ENGINEERS

Chicago, Ill.
May, 1935

To the Editor
Contractors and Engineers Monthly

In regard to a charge for contract plans and specifications, it is our practice to make such a charge, allowing bidders a rebate of one-half the cost, providing such are returned within a reasonable period.

TOOLS DON'T CAUSE ACCIDENTS



Public Funds Saved By Contract Method

Public funds are more wisely and economically expended in the highway field by the use of the contract method, said Joseph A. Tomasello, recently elected Treasurer of the New England Road Builders Association, in an address at the annual meeting of the Association.

For the purpose of comparing the relative efficiency of contract and day labor highway work, the Bureau of Public Roads last year required each state to undertake at least one project by the direct-labor method. Bids were taken from contractors in the usual way and the project was selected after the taking of the bids, thereby providing a set of contractor's prices on that particular project with which to make comparisons.

A complete and accurate cost record of this test project in Massachusetts was obtained, and the final result showed that the total cost of the direct-labor work was 45 per cent greater than the cost of the project would have been if done by the contractor at the prices he submitted. The state's total cost was \$104,015.64 as compared with a cost of \$71,708.03 if the work had been done by contract.

It has been reported that the direct-labor test project in Rhode Island cost over 100 per cent more than if it had been done by the contractor.

"The fact that the cost of day labor work as compared with contract work is much higher, as proved by the results of these test projects, is not new. But the conduct of these test force-account projects under conditions making for a fair comparison and the development of reliable figures of comparative costs, was of great value, and should discourage public officials who are interested in economy of expenditure of public funds from carrying on day labor operations in the highway field," Tomasello said.

In addition to furnishing plans and specifications, bidders' forms, and blanks for statements required by various state agencies, we furnish a service to contractors and material and equipment companies, making available to contractors information as to where materials and equipment may be purchased, and supplying material and equipment firms up-to-date lists of contractors.

During the time of advertising important projects, as many as two hundred letters a day are sent out from our office in connection with the above. This is appreciated by contractors and material men and it is very seldom that we receive a complaint as to the cost of plans and specifications or as to the amount to be rebated upon their return.

Charles H. Hurd
CONSULTING ENGINEER

Indianapolis, Ind.
May, 1935

Composite Pile Trestle Structure

(Photos on page 44)

Doullut & Ewin Used Floating Pile Driver and Travelers for Caps on Apalach. Bridge

lengths of piling ordered by the foreman of the floating pile driver were loaded on a barge and taken out to the pile driver each morning. All splices were tightened up before driving as the bolts might have become slightly loose during handling in the yard and from the barge to the leads of the driver.

Conditions To Be Met In Driving

According to the contract and the specifications the trestle piles had to

meet five conditions, some of which were a bit contradictory: 1. The piles had to have 15 tons bearing; 2. The maximum driving was limited to 18 tons, unless otherwise permitted by the Engineer; 3. The splice had to go 20 feet below ground surface; 4. The untreated pile if driven more than 3 feet after the 15-ton-bearing was reached by the Engineering News formula, was paid for at 10 cents per linear foot; 5. If the treated pile went below the specified splice elevation it was paid for at one-half the unit price for all over-driving.

The 5-Pile Bents

The bents of five piles each were driven with the center pile plumb, the two intermediate piles on a batter of $\frac{3}{4}$ -inch per foot, and the two outer piles on a batter of $1\frac{1}{2}$ -inch per foot. The piles were cut off horizontal after being pulled into place by methods to be described later, treated with two applications of hot creosote oil and one of hot pitch and then each individual pile

(Continued on page 17)



C. & E. M. Photo

The Floating Pile Driver as Seen from a Pile Barge Alongside

NORTHWEST

*The outstanding
 $\frac{1}{2}$ and $\frac{3}{4}$ Yd.
Shovel!*

Compare them
Point by Point with Other Machines

- Both upper and lower machinery frames are heavy steel castings.
- They steer with full power on both crawler belts while turning, as well as when going straight ahead.
- All high speed shafts roll on ball or roller bearings.
- The power take-off is the equivalent of the finest speed reducer—helical cut gears running in oil.
- The "feather-touch" clutch control reduces operating fatigue, speeds up operation and increases output.

- Full convertibility permits meeting every problem.

Outstanding value at a price
within reach of your
pocketbook!

Ask about prices
before you
buy!



Shovels, Cranes
Draglines
Pullshovels
Skimmers

Built in a Range of 10
Sizes — $\frac{1}{2}$ Yd. Capacity
and Larger

Gasoline, Oil
Diesel or
Electric
Powered

NORTHWEST ENGINEERING COMPANY
1727 Steger Bldg., 28 East Jackson Blvd., Chicago, Ill.
Please send me complete information on machine checked:
☐ Shovel ☐ Crane ☐ Dragline ☐ Pullshovel
☐ $\frac{1}{2}$ Cu. Yd. ☐ $\frac{3}{4}$ Cu. Yd.
Name _____ Address _____ City _____ State _____

THERE were three pile trestle sections to the Apalachicola Bay bridge, one 1,500-foot section as an approach to the main river crossing; a 3,000-foot trestle with concrete deck at about the center of the crossing and a 9,394.71-foot section toward the East Bay shore. The contract for the construction of the pile trestle sections with concrete deck and pre-cast concrete hand-rails was awarded to Doullut & Ewin of New Orleans, La., for \$681,748.19. This article will deal entirely with the composite piles and the driving of the 5-pile bents on 25-foot centers with a floating and an overhead pile driver. The next article, the third in this series, will cover the concrete plant and the manufacture of the hand-rails in the contractor's yard.

The deck of the trestle is 18 feet above mean water while the embankment is only 6 feet above mean water, making it necessary to have a transition section of a vertical curve from the trestle section to the embankment. The average depth of water for the crossing is $4\frac{1}{2}$ feet with a maximum of 8 feet and a channel of 26 feet where the swing span bridge is built. These depths had considerable effect on the method of driving the piles as it was necessary to build an overhead pile driver to handle some of the driving near the Apalachicola shore because the floating driver could not get in. The overhead pile driver insured early completion of driving, thus releasing about half the contractor's floating plant.

The Bridge Deck

The concrete deck of the bridge carries a 24-foot roadway between curbs with an 8-inch slab. The curbs are 9 inches high, 16 inches wide at the top and carry the hand-rail with posts 10 x 12 inches in section. With the bents spaced 25 feet on centers and the I beam stringers 50 feet long the expansion joints are placed at alternate bents where the posts are 10 x 18 inches in section. The expansion joints are $\frac{3}{4}$ -inch. The I beams are Carnegie section 21 inches high and weigh 58 pounds per foot.

The Composite Piles

The composite piles consist of a treated top section approximately 40 feet in length, with a 9 to 10-inch tip and a 12 to 14-inch butt measured 3 feet from the end, spliced to an untreated pile with an 8-inch tip and a 9-inch square butt. These untreated piles, which remain always beneath the bed of the Bay, vary in length from not less than 20 feet to 45 feet. In preparation for joining, both the untreated and the treated pile were squared carefully at the abutting ends. The butt of the untreated pile was cut accurately to a 9-inch square for forming the connection, and a $\frac{3}{4}$ -inch round dowel 12 inches long was placed, centered, in the butt to run half its length into the treated tip. A $\frac{3}{16}$ -inch plate, 8 inches square with a hole in the center for the passage of the dowel was placed between the two sections of the pile. Four 3 x 4-inch oak splines 3 feet 4 inches long were bolted with $\frac{5}{8}$ -inch bolts to the piles with four bolts in each pile, two each way at right angles. When driven the pile splice was at about Elev. —25.

The piles were handled by a 35-ton American locomotive crane in the contractor's yard at Apalachicola where three men per shift with an electric drill made up just enough joints to take care of the requirements of the floating pile driver. It was necessary to have a large number of piles with varying lengths of untreated sections because of the requirements of driving. The required



A Pioneer Duplex Plant in Operation by Racine County, Wisconsin

Crushing, Screening Plant Has Many New Features

Bottom-deck feed; shaft and gear drive, eliminating long chains; anti-friction bearings throughout; and belt-conveyor return of the crushed material are some of the features of the new Pioneer 15-35 duplex crushing, screening and loading plant, made by the Pioneer Gravel Equipment Mfg. Co., 1511 Central Ave., Minneapolis, Minn. This new plant has a capacity of 150 to 200 tons an hour.

The bottom-deck feed of this new plant feeds the primary and secondary crushers to capacity constantly. The swivel drive on the feeder conveyor permits feeding from any angle within 180 degrees, increasing flexibility and efficient shovel operation. The material flow allows all undersized gravel in the pit-run material to be screened out immediately without passing through a scalping screen and passes all oversize material directly to the jaw crusher. The finished crushed material passes through the top deck onto the blank middle deck and directly to the mixing hopper.

Steady crushing is secured by the Pioneer design for flow of material. The work of the two crushers is balanced automatically by the jaw crusher without changing the screen plates and even sticky materials flow smoothly over both decks and through the jaw crusher to the roll crusher, which can produce from 75 to 90 tons an hour of 1-inch minus material.

For returning the crushed material from the jaw and roller crushers to the top screen deck, a belt conveyor is used instead of a bucket elevator.

The Pioneer shaker screen pan is carried on six SKF anti-friction bearing hangers. The drive to the screen is by means of the single overhead eccentric, also SKF-bearing equipped and fully enclosed.

The entire plant is of rugged construction, with anti-friction bearings throughout. Timken bearings are used on the roll crusher, conveyors and

wheels, and SKF self-aligning roller bearings on the jaw crusher and shaker screen. There is a multiple V-belt drive from the jaw to the roll crusher, and a two-strand, high-speed roller chain from the crusher to the shaker screen. Both feeder and delivery conveyors are driven by shaft and bevel gear drives. The moving weight of the plant is approximately 56,000 pounds.

Specially-Processed Wood for Concrete Forms

Laminex Plyform, a specially-processed wood which is smooth, light, rigid and unaffected by climatic conditions, developed for use as forms in concrete construction, is made by the Wheeler Osgood Sales Corp., 122 So. Michigan Ave., Chicago, Ill.

Plyform is designed for economical and efficient concrete form construction. Its laminated cross grain makes it warp-resistant and spit-proof. When specified, it is treated with a special waterproofing fluid to form a surface which eliminates moisture absorption and slips readily from the concrete when the form is removed.

Due to the nail-holding power of Laminex Plyform, fewer and smaller nails need be used, making salvage easier. It is claimed that Plyform may be used over and over again, the average running from four to ten re-uses, but often as much as twenty-two.

Wheeler Osgood Sales Corp. offers a special service to help contractors with their problems of concrete forming. Such help, together with further information on Laminex Plyform and its uses, and samples, will be furnished free upon request.

St. Louis Distributor Displays 1935 A-C Line

The Joseph Kest Tractor & Equipment Co., St. Louis, Mo., has had on display in its show rooms at 1510 North Thirteenth Street the full line of 1935 Allis-Chalmers tractors and graders, which embody many new features and improvements, including the A-C oil-burning engine.

The Kest Co., of which Joseph Kest, Jr., is President; L. May, Secretary and Treasurer; and Lyle W. Johnson, Sales Manager, has a sales force of ten men and handles all types of contractors' equipment and supplies. It also handles used equipment, carries a full line of parts and offers 24-hour service.



White and Indiana trucks offer most complete line in industry—a capacity and price to meet every requirement better at lower cost

45 WHITES MAKE GREAT RECORD AT FORT PECK DAM

The Ft. Peck Dam, Montana, is the largest earth fill dam in the world—involving an expenditure of \$87,000,000 and the hauling of 12,000,000 yards of dirt, most of which is bear paw shale.

A fleet of 45 Whites, operated by Spillway Builders, Inc., is used on this job. The White Model 718, above, operates on a 10-minute cycle from shovel to dump and back, 240 miles a day.

● The new construction projects to be authorized all over the country in the government's \$5,000,000,000 program will demand rugged trucks of all capacities that can stay on the job continuously and operate at low cost.

Fleets of White and Indiana trucks at Boulder Dam, Grand Coulee Dam, Fort Peck Dam, Joe Wheeler Dam, Norris Dam, etc., have proved they can haul heavier loads, make more trips and operate for less money than any others.

It takes White's built-in quality—precision manufacturing—finest materials in every part—to stand up under this gruelling work.

The complete White-Indiana line includes:

WHITE TRUCKS starting at \$1195 (chassis at factory); ranging from 8,000 to 40,000 lbs. gross and including 4 and 6 wheelers, trucks and tractors.

INDIANA TRUCKS at \$695 (chassis at factory) 11,000 lbs. gross and \$795 (chassis at factory) for tractor, 14,000 lbs. gross. Also 4 and 6-wheel drive Indians, 10,000 lbs. to 40,000 lbs. gross and 2 Diesel-powered Indians, 22,000 lbs. and 28,000 lbs. gross.

The White Branch or Dealer in your city will be glad to give you complete specifications. Be sure to see the White-Indiana line before you buy.

THE WHITE MOTOR COMPANY • CLEVELAND



Get our low prices on Tilters and Non-Tilters.
THE JAEGER MACHINE CO., 201 Dublin Ave., Columbus, O.

White AND INDIANA TRUCKS

Advertisement

Development of Speed in Power Shovels

In the development of power shovels, the first of which were built some fifty years ago, speed and more speed has been the constant goal, for it is chiefly through speed that cost of work is lowered.

The first shovels, designed for railroad work and called "Railroad Shovels," were built on flat cars, and were, according to present standards, of rather crude design. Their operating mechanism was simple but effective and permitted the boom to swing through only 180 degrees, or a half swing. Railway cars were used for removing the excavated materials.

First Step Toward Increased Mobility

The next step toward saving time was to mount the shovel on flat-tired traction wheels. This was an improvement but, where the traveling was rough or the ground soft, it was necessary to provide a floor on which the shovel could travel. The use of these floors or mats, as they were termed, was cheaper than railway tracks but tracks were still necessary and time was lost in trying to keep the railway cars, still used to remove the dirt, within reach of the shovel.

Full Swing Design Due to Temperamental Mule

To increase the mobility of the outfit, teams and wagons were next used to serve the shovel. While this overcame the lack of mobility of the dump cars, difficulty was experienced in spotting the wagons within easy reach of the dipper. Then came the full revolving shovel to bridge the distance between the cut and the vehicles. Less time was required to swing the shovel through a long arc than to back the mules and spot the wagons accurately within close reach of the shovel. Indeed, we might say that the full-swing shovel design was brought about by the temperamental mule.

Crawler Track Introduced

The crawler track was first used around 1916. It represented a long step in improving the mobility of the shovel and in permitting maneuvering in the cut. The time lost in this operation was reduced by from 80 to 90 percent. Coincident with this improvement came the gasoline motor and many minor developments, all of which made the shovel a more effective and versatile tool. Its speed was increasing.

Three-Quarter Swing Design Increases Speed

The latest step in the achievement of maximum speed, increased mobility, and low cost of shovel excavating came with the introduction and development of the modern three-quarter swing shovel—a development made possible through the use of motor trucks for hauling away the excavated material. The ease and speed with which motor trucks can be spotted exactly where desired made the full-swing design no longer necessary.

The three-quarter swing shovel was developed by Austin engineers after a careful analysis of the advantages and disadvantages of the full-swing design. They found that, with motor trucks in such general use, the full swing was of no practical advantage except on very special work. They also found that the substitution of a three-quarter swing enabled them to design a shovel of less weight and faster production speed—one that was easier to handle and would reduce digging costs. The results of these studies, together with other important improvements, were incorporated in the Badger Shovel.

Advertisement

Elimination of the full-swing design made a turntable between the car body and the traction unit unnecessary and this not only lowered the center of gravity but also simplified the construction and greatly reduced the weight without any loss in effectiveness. The machinery deck was made stationary and the formerly necessary tail used to counterbalance the dipper was eliminated. To compensate for any lack of full swing, crawler tracks that permitted quick and easy shifting of the shovel were designed. By building the crawler tracks and the machinery deck as a rigid unit, the entire weight of this unit is utilized as a counterweight for the shovel and its loads. Its weight is greater and more effective than that of the revolving deck of the full-swing shovel.

Three-Quarter Design Speeds up Boom Swing

Since the boom on the three-quarter

Advertisement

design is carried on a small rotating table, it follows that, when the boom is swung, there is nothing to be moved except the boom and its dipper and the small table. The weight of these parts is less than 25 percent of the total weight of the shovel as compared with 65 percent of the shovel's total weight which must be swung in the case of the full-swing shovel. It is quite apparent that power is saved and that swings can be started and stopped much more quickly. In short, the Badger Shovel weight has been reduced more than one-third of that of full-swing shovels of about the same capacity.

Anti-Friction Bearings—No Cab to Restrict Vision

Two other features which contribute to faster production speed are anti-friction bearings throughout and the placing of the operator out in the open where every part of his work is visible

Advertisement

at all times. There is no enclosed cab to restrict his vision and cause him to slow up his swings to avoid accidents.

To offset the lower machinery table, it was necessary to compensate for the loss of boom height. Otherwise the shovel could not dig or dump at heights required for efficient work. This was accomplished by using a curved boom instead of the old style straight boom. This simple expedient permits dumping at even higher points than other types of shovels.

Departure From Traditional Design

Thus, by departing radically from traditional design as established by the early "Railroad Shovels," the Badger Shovel permits a faster cycle of operations, gives greater speed of output; lowers the cost of moving dirt and because of better fundamental design, requires less expenditure for maintenance and repairs.

Announcing

**A
NEW MODEL
AUSTIN-WESTERN
BADGER**

moves more dirt

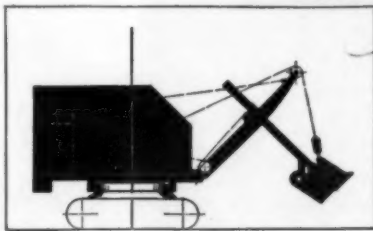
**more power
less swinging weight**

● Speed of operation has always enabled the Badger to compete with larger shovels in capacity per hour.

Those familiar with the Badger's operating principle (see diagram) will readily see how a reduction of dead weight and an increase in the power of the motor has given this new unit a capacity, both in speed of digging and loading, far ahead of any other similar equipment.

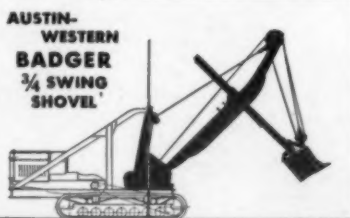
Through the use of alloy steels in boom, dipper stick, and bucket the dead weight of these parts has been reduced. This saving in addition to the increased horse power makes it the ideal tool not only for speed of operation but for rapid transportation and easy handling. Can be furnished with a half-yard bucket at slight extra cost.

Write for details on the engineering features of this machine which make it the big producer at low operating costs.



The essential difference between these two shovel designs is whether the counterbalancing weight must be moved at every swing or can be used effectively while standing still. Notice that in the Badger the boom is counterbalanced by idle weight. Fast starting against minimum inertia and prompt stopping without waste of time and force to brake the momentum are achieved.

**AUSTIN-WESTERN
BADGER
¾ SWING
SHOVEL**



ROAD GRADERS • MOTOR GRADERS • ELEVATING GRADERS • DRAGS

Austin-Western

BITUMINOUS DISTRIBUTORS • ROAD-MIX MACHINES • CULVERTS
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CRUSHING AND WASHING PLANTS • SWEEPERS AND SPRINKLERS • SHOVELS • CRANES • ETC. • SNOW PLOWS

The Austin-Western Road Machinery Co.
Y, Aurora, Illinois

Please send complete information on the new Badger Shovel.

Name..... 475

Address.....

City..... State.....

DUMP CARS

Methods of Driving Baltimore Tunnel

(Continued from page 2)

were housed in a 70 x 14-foot galvanized iron house with a high center section where the accumulator stood. The electrical shop was located in one end of this house. The hydraulic power house equipment consisted of one Watson-Stillman 28-gallon per minute horizontal four-plunger pump operating at a nominal 5,000 pounds pressure and driven by a Crocker-Wheeler 100-horsepower motor, and a second similar pump of 10-gallon per minute capacity driven by a Westinghouse 40-horsepower motor. These pumps were capable of operation at 10,000 pounds pressure but on this contract all hydraulic equipment performed satisfactorily at about 5,000 pounds.

The larger pump was run continuously, idling on the line except when hydraulic power was being used when it immediately made up any loss of water drawn from the Watson-Stillman hydro-pneumatic accumulator which had a 42-inch air piston, an 8-inch hydraulic ram and a 48-inch stroke. With the 42-inch air piston under an air pressure of 200 pounds per square inch, a downward pressure of 277,000 pounds was produced on the hydraulic ram equivalent to a dead weight of 138½ tons. The hydraulic pressure would be, therefore, 277,000 pounds divided by 50, or 5,540 pounds per square inch. The hydraulic pressure was lowered merely by reducing the air pressure. The air is bottled up in the reservoir and in the air cylinder of the accumulator and is not discharged. Therefore, it was necessary to have only a small air compressor which was used for initially charging the system with compressed air and for compensating for any slight leakage that might occur.

The accumulator was used as a reservoir for water under pressure, receiving the constant delivery from the pumps and delivering it intermittently to the shield line, according to the demands for pressure water. The accumulator moving parts actuated two trip mechanisms, each of which controlled the operation of the suction valves on one of the pumps. Thus the pumps, while running continuously, delivered water to the accumulator only when needed to maintain a sufficient capacity in reserve. The hydraulic equipment in the power house required the attention of but one man for each of the three regular 8-hour shifts.



AIR COMPRESSOR from FORD PARTS

With the patented Smith Compressor Head you can now build your own Motor-Compressor with 60-cubic foot capacity. Head is furnished with high-speed compressor valves over two cylinders, unloader and complete instructions for mounting on your Model A or B Ford Motor. These Motor-Compressors are now being used in over twenty states for drilling rock, breaking pavement, riveting, sand blasting, painting, etc.

Write for full information and prices.

GORDON SMITH & COMPANY
Incorporated
1228 State St. Bowling Green, Ky.



C. & E. M. Photo

Dumping Muck Box at Philadelphia End After Completion of Side Drifts

The Pneumatic Equipment

The pneumatic equipment for furnishing air for all drilling and for the operation of the concrete pump and grouting

machine consisted of three 810-cubic foot Ingersoll-Rand Imperial compressors, one of which was located in the hydraulic power house and the other two in a separate structure. For all drilling, Ingersoll-Rand S49 drills were used with 1-inch hex steel. The maximum steel used was 10 feet for 8-foot holes in short sections but most of the work was done with 6-foot steel. From 16 to 30 pounds of 40 per cent du Pont dynamite was used for each hole, with delays. All shots were covered with manila mats in the tunnels. The blasting was restricted to light shots because of the proximity of the old tunnel and the nearness of old brick structures above the tunnel.

Mucking the Main Tunnel

The main tunnel was mucked with a Conway mucking machine with one operator for each shift. There were four hand muckers who cleared the track and hooked the industrial railway cars to the "cherry picker" which had an operator in a cab near the top of the tunnel. The

(Continued on page 22)

Bucyrus-Erie Appoints New Distributor

The appointment of the Louisiana Tractor & Machinery Co., Inc., Baton Rouge, La., as Loadmaster distributor for the entire state of Louisiana has been announced by the Bucyrus-Erie Co., South Milwaukee, Wis. The quarters of this new distributor are located at 14th and North Boulevard Streets.



FOR CONCRETE

Making and Holding Forms for Piers, etc. Pulling in Bulges on Piers, Coping, etc. For General Utility.

Write for Circular

ADJUSTABLE CLAMP CO.

427 N. Ashland Ave., CHICAGO

the application of
**PERMANENCE,
DEPENDABILITY
and ECONOMY**
in road construction.

WELDED STEEL FABRIC

GUARD RAIL

Truscon manufactures a complete line of steel products for concrete road construction - welded steel fabric for producing permanent and wear-resisting surfaces; road forms for durability and for economy; expansion joints and contraction plates to relieve stresses in concrete bases and provide straight, regular cracks when the concrete expands or contracts; rolled steel bars for supplemental reinforcing at roadsides and crossroads; curb bars and edge protectors; guard rails for highway protection and safety.

Trusconize your roads - that's the safe, the modern and economical way of road building. Write for full information on all these Truscon highway products.

TRUSCON STEEL COMPANY, YOUNGSTOWN, O.



IN DEEP MUD - BROKEN GROUND - CRUSHED ROCK

THIS NEW GROUND GRIP TIRE WILL PULL YOUR EQUIPMENT THROUGH

THE new Firestone Ground Grip Tire, built with a deep, thick, rugged tread, with widely spaced, self-cleaning bars of a new and tougher tread rubber, provides super-traction to move heavy loads. That's why this new tire makes its own road!

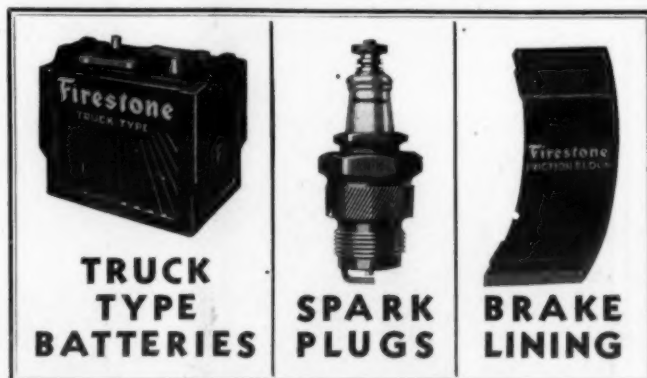
This big rugged tread, containing 54% more rubber, is held securely to the Gum-Dipped Cord body, because between the tread and the body there are two extra layers of Gum-Dipped High Stretch Cords, making a single unit of great strength. This is a patented Firestone construction feature.

The new line of Firestone Ground Grip Tires includes sizes and types for your trucks, cars, and tractors. See your nearest Firestone Service Store or Firestone Tire Dealer today. Let him tell you how these exclusive Firestone construction features enable you to make more trips—do more work and give you more dependable and economical service.

★★★★★ Listen to the Voice of Firestone—featuring Richard Crooks, Gladys Swarthout, Nelson Eddy, or Margaret Speaks—every Monday night over N. B. C.—WEAF Network . . . A Five Star Program



AUTO SUPPLIES AT A BIG SAVING



Firestone

Welding Speeds Work on Bridge at San Francisco

San Francisco's dream of a bridge spanning the water barrier between it and communities on the east side of the bay is rapidly becoming a reality as construction proceeds on the \$77,000,-

000 San Francisco-Oakland Bay Bridge. This bridge, which is over 8½ miles long including approaches, contains one of the longest cantilever spans in the world. This single span over the ship channel is 1,400 feet in length and suspended for 576 feet of its length. Only the Quebec Bridge and that over the Firth of Forth are longer.

Two modern engineering developments are speeding construction of this bridge. One of these is a specially constructed caisson of the compressed air

flotation type for anchoring the piers; the other is a giant wire-spinning wheel for spinning the cable.

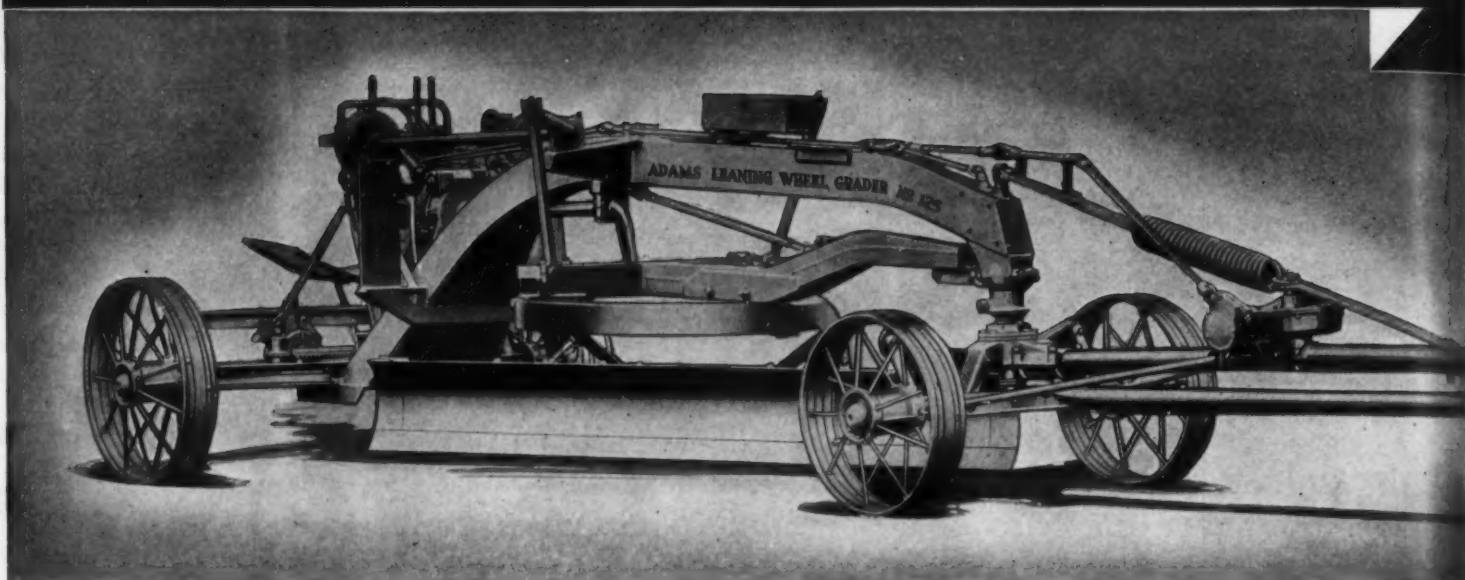
Wire-Spinning Wheels

The wire-spinning wheels, over one hundred of which have been built for spinning cable for this bridge, are entirely of arc-welded steel construction. Built by R. B. Hayward Co., of Chicago, these wheels are 94 inches in diameter, 4 inches thick and weigh approximately 5,000 pounds completely assembled. They are built of 8 and 10-gage steel

welded by the shielded arc process with Lincoln welding equipment and electrodes. Each wheel will carry 16 tons of 3/16-inch steel wire.

Six of these spinning wheel units, consisting of two wheels and drum, are used on one huge cable spinning machine which can turn out over 80 tons of wire rope in a single length without reloading. A single 8½-mile length of 1½-inch wire rope, such as could be produced by this machine at one loading, would contain over 2,500 miles of steel wire.

ADAMS *Presents*



Fifty years ago J. D. Adams invented the adjustable leaning wheel grader and marketed his first model. That invention, and numerous later ones, have long since established Adams Leaning Wheel Graders in a position of leadership.

Now Adams presents four new graders that set a new high mark in mechanical excellence and operating advantages. A year of severe field

tests have conclusively proved their practicability and durability. Their extreme simplicity will impress you—their great strength and rigidity will amaze you—and the things you can do with the blade positively will astound you. Not only can you get new, extreme blade positions for every kind of cut but you get them quickly and with little or no mechanical adjustment.

Never before have so many good features been built into one machine—never before have you been offered such grader value. Here, in fact, is "The Kind of Grader You've Always Wanted."

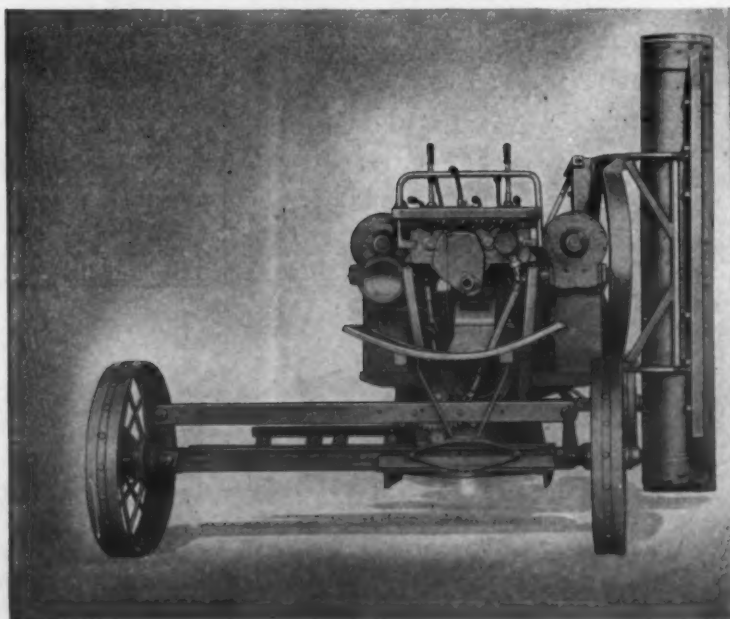
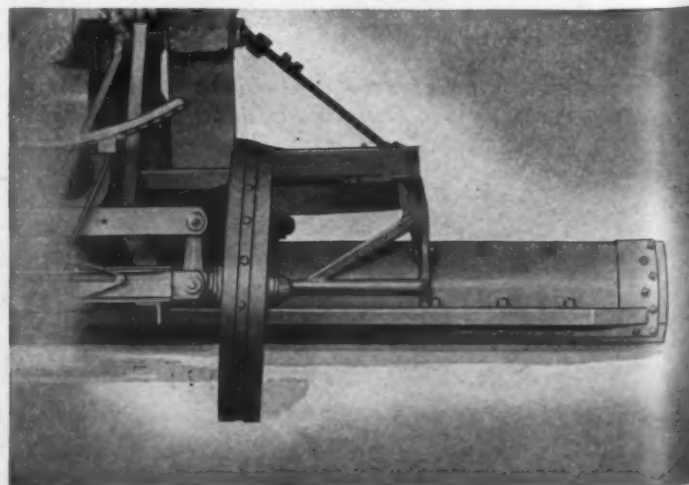


Illustration at left shows extreme blade adjustment possible with new Adams design; this position can be obtained without any readjustment of lift links—a decided advantage as every operator knows... Blade can be extended far outside the line of wheels for shoulder cuts—6 feet with 10 foot blade, and 7½ feet with 12 foot blade. Extensions increase reaches to 9 feet and 10½ feet respectively.



Picks and Shovels

(Continued from page 1)

the bridge before and after school hours to keep the children moving and the usual afternoon audience was always there. Failing to get results at the school, the worried engineer took up the matter with a number of parents. But parental lectures did not lessen the troubles at the bridge.

Two pedestrians, one man and a woman, were killed at the bridge, at

night, which increased the engineer's worries over the danger to the children.

It is unfortunate that the school authorities failed to realize their responsibility in the matter and neglected the opportunity of driving home an excellent safety lesson.

Posters Would Help

However, it would have saved the engineer and contractor a good many headaches and near cases of heart failure, and might have averted the tragedy

of a fatal accident, had the contractor invested in a few of the striking and effective Safety posters, which are available from the National Safety Council at a nominal cost, and posted them on the structure and along the children's route. They might also have jolted the school authorities into much-needed action by presenting the school with a few of these posters, which carry home the message of safety in a far more effective manner than daily "lectures" by harassed school teachers and irate parents.

Hercules Branch Moved

The Hercules Motors Corp. of Canton, Ohio has announced the removal of its West Coast Office from 613 Russ Bldg., San Francisco to Room 523 Transamerica Building, 7th & Olive Sts., Los Angeles, Calif.

Oliver S. Kelly, direct factory representative on the West Coast, is now located at the latter address, from which point he contacts manufacturers and dealers in the western part of the United States.

4 New GRADERS

YOU WILL WANT THESE NEW FEATURES:

New Box-Type Frame—made of heavy ship channels and steel plates, electric-welded full length. Has great strength and rigidity to hold blade firmly to the cut—100% stronger against twist than previous Adams frames and that's plenty strong.

Wide Range of Blade Positions—with no changes in lift link positions or shift of moldboard on 90% of your work. A big operating advantage—ask any operator.

Quick Adjustments—with power-operated controls blade can be raised from plowing position to perpendicular (as shown on opposite page) in 40 seconds. Frame can be shifted on rear axle (for one way work) in 45 seconds. Can you do this with your grader?

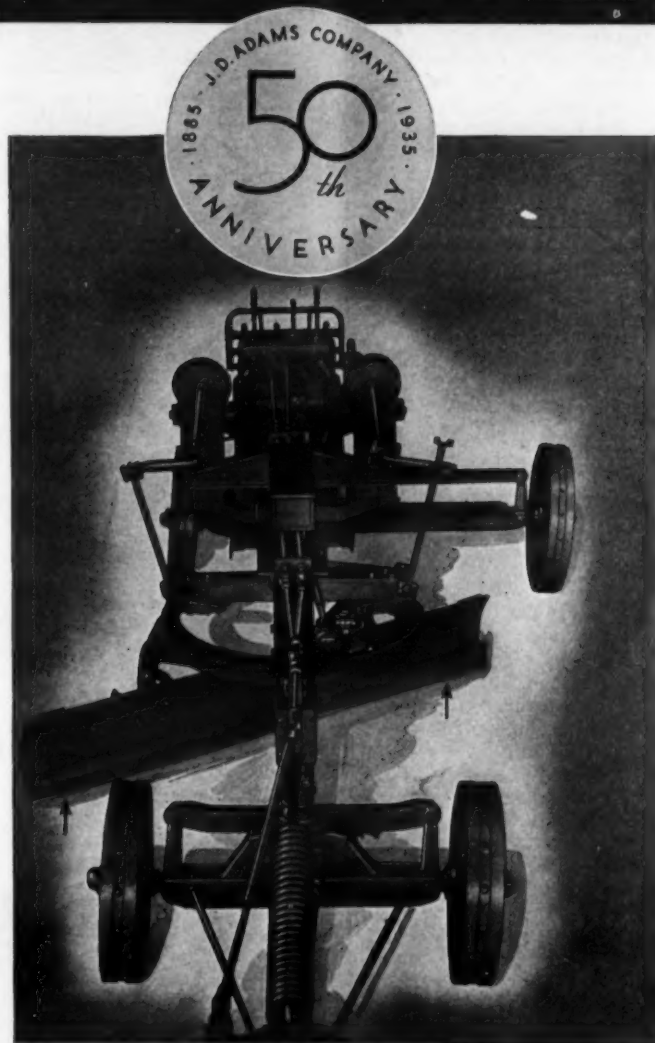
Extraordinary Visibility—due to narrow frame and simple, clean-cut design throughout, operator can always see full length of blade and observe work being done. Increases operator's efficiency.

Many Mechanical Features—including exclusive anti-coasting devices on operating adjustments which work automatically and lock adjustments in position until changed by operator . . . Renewable ball and socket connection between frame and front axle . . . Deep curved moldboard for rolling dirt with least friction . . . Low draft connection to frame provides enormous cutting capacity . . . New "T" type drawbar—strong, simple and improves visibility . . . Positive-acting, trouble-free steerable tongue . . . Rigid, all-welded construction throughout which guarantees long life.

Don't buy any grader until you investigate these new machines. Available in 12 foot and 10 foot sizes and with hand or power-operated controls. Ask your local Adams representative for descriptive matter or write directly to

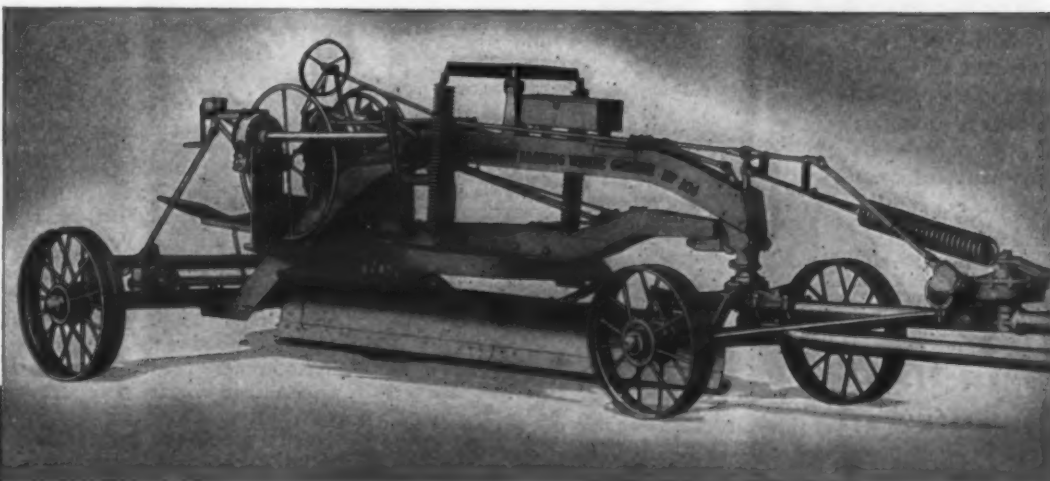
J. D. ADAMS COMPANY
INDIANAPOLIS, INDIANA

Branches, Representatives and Distributors throughout United States



Adams new box-type frame is built of heavy ship channels and steel plates welded their entire length.

Illustrated on opposite page is Grader No. 125 with 12 foot blade and power-operated controls; 10 foot model known as No. 103. Adams power-operated controls afford quick, positive and accurate adjustments with saving of time, energy and money . . . Grader No. 104 (shown at right) has 10 foot blade and hand-operated controls; 12 foot blade model known as No. 124. Hand-operated machines have equalizing lift springs to make blade manipulation easy.



The Dredge Manatee With Diesel Power Delivers the Goods

(Photo on page 44)

THE dredge Manatee was designed by R. C. Pierce, Assoc. Mem., Am. Soc. C. E., Vice President and Treasurer of Wilbanks & Pierce, Inc., of New Orleans, La., whose 2,200,000-cubic yard highway fill contract was described in our May issue.

The dredge was built at Slidell, La., by the Canulette Shipbuilding Co. The machinery was set by the contractor's organization.

The dredge hull has an overall length of 120 feet, is 7 feet 7 inches in depth and has a beam of 34 feet. The hull and house are built entirely of steel with the exception of the sections of the roof over the living quarters and the operating room, which are covered with wood sheathing and asbestos built-up roofing to make the rooms cooler. The hull has two longitudinal bulkheads and five cross bulkheads. The former were designed to furnish the principal strength of the hull. The supports for the spuds at the stern, and for the digging ladder at the bow, are carried directly on these longitudinal bulkheads. The loads from all the principal pieces of machinery are carried directly to these bulkheads through cross girders of 28-inch depth spaced at 6-foot intervals under the engine and pump pits. Two 12-inch x 12-inch x 120-pound girder beams, with cross stiffening webs welded between the flanges at close intervals, rest on these cross girders and run the length of the engine and pump pits, carrying the main engine and dredge pump, the auxiliary engine and generator, and holding these units very effectively in alignment.

Bulkheads

The five cross bulkheads and the two longitudinal bulkheads divide the hull into sixteen watertight compartments, in addition to the engine pit and the pump pit. Four of these compartments, located on either side of the dredge and about a quarter of the hull length from each end, are used for fuel oil storage. The location of the compartments permits their use in trimming the dredge.

Efficient Dredging Unit Designed by R. C. Pierce of Wilbanks & Pierce, New Orleans, La.

The four compartments have a total capacity of 32,000 gallons, enough for a normal month's operation. With this amount of oil aboard, the dredge draws 6 feet, and with the oil storage compartments empty, she draws 5 feet.

Digging Ladder and Hoist
The digging ladder is 50 feet long, the

main members being 30-inch x 10½-inch x 100-pound girder beams. The back end of the ladder pivots vertically on heavy trunnions set into the sides of the ladder well, which extends back between the extensions of the main longitudinal bulkheads for a depth of 12 feet from the bow of the dredge. The cutter is 70 inches in diameter and the cutter drive shaft is 7½ inches in diameter. The 200-hp cutter motor is a Westinghouse mill-type unit, force-ventilated, and will operate at full load through a speed range of 425 to 850 rpm. These speeds are reduced through gearing so that the cutter can be operated continuously at any speed between 14 and 28 rpm.

The hoist mounted forward directly beneath the operator's room and on the main deck is a Bucyrus-Erie 5-drum hoist with a 20,000-pound line pull and is driven by a 60-hp Westinghouse Type SK variable speed motor. This hoist picks up the two stern spuds, swings the dredge and raises the ladder. The swinging anchors are run out 300 to 600 feet

on either side forward. The dredge is operated with a maximum 225-foot swing. For moving forward the dredge is pivoted alternately on the two stern spuds which are built up of structural steel and measure 24 inches x 25¼ inches and 60 feet long.

The Pilot Clutch

A new development in connection with
(Continued on page 18)



2" Self-Priming Centrifugal Pump

Easily carried by one man; 100% automatic. No handles or petcocks to be adjusted—weighs 93 pounds. Four-cycle engine with oil reservoir in crankcase.

Easy to start—Speed control—Air cleaner. Foot and rope starters—self-oiling. Engine has only one place requiring lubrication.

Ask for Specification Sheet 20A
Marlow Pumps, Ridgewood, N.J.



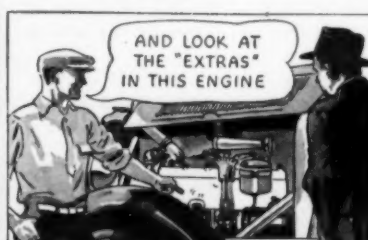
Dodge 1½-Ton 16" Wheelbase Chassis and Cab with 12' Stake Body—\$730*

DRIVER MULROY SAYS, "I WOULDN'T DRIVE A TRUCK WITHOUT HYDRAULIC BRAKES."



THESE DODGE HYDRAULICS WILL SAVE US PLENTY

HYDRAULIC BRAKES—work better, safer... because they stay equalized. Save money on tires, brake relining and adjusting expense. Only Dodge, of the three lowest-priced trucks, gives them to you.



AND LOOK AT THE "EXTRAS" IN THIS ENGINE

6-CYLINDER, L-HEAD ENGINE—Simple, compact, powerful! Gives you many such money-saving features as valve seat inserts, full-pressure lubrication, 4 main bearings, 4 piston rings, aluminum alloy pistons, etc.



AND THE BEST REAR END, TOO!

FULL-FLOATING REAR AXLE—Dodge was first of the three lowest-priced trucks to give you a full-floating rear axle along with eight tapered roller bearings to save repairs, save trouble, cut upkeep expense for you.

COMPARE THESE AMAZING VALUES... AS LOW AS \$365*

TRUCK drivers know what they're talking about when they say, "Dodge is the best-built truck in the lowest price field." If you're going to buy a truck, you owe it to yourself to get the facts.

Among the three lowest-priced trucks, Dodge actually is priced lower on some models... slightly higher on others... the difference in price either way is only a few dollars. But what a difference there is in construction—in features that make your truck last longer—fea-

tures that you can see must cut gas, oil and tire costs!

Before you buy any truck, see your Dodge dealer. Ask him for a "show-down" of Dodge high-priced features that are switching thousands to Dodge. See him today.

DODGE DIVISION - CHRYSLER MOTORS

List prices at factory, Detroit, subject to change without notice. Special equipment, including dual wheels on 1½-ton models, extra. Time payments to fit your budget. Ask about the official Chrysler Motors Commercial Credit Plan. (Dodge passenger cars \$645 and up.)

Dependable DODGE TRUCKS

AMERICAN GOPHER SHOVEL

SHOVELS
CRANES
DRAGLINES
HOISTS
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BLOCKS
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DRIVERS
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NEW ½ YARD, Model 350

For greater line pulls, larger capacities, faster speed, less weight, and low operating costs, we invite investigation and comparison

Send for new roto publication, "American Gopher Shovels" illustrated, showing action pictures "on the job."

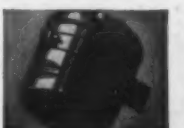
AMERICAN HOIST & DERRICK CO.
ST. PAUL, MINN.



ROLLER-BEARING UNIVERSALS—Another feature of quality truck building—dirt-proof, prevent backlash, save upkeep expense.



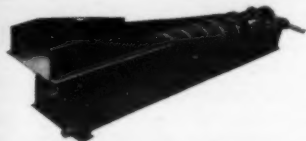
VALVE SEAT INSERTS—Another money-saving feature pioneered by Dodge in low-priced trucks. Saves... cut valve grinding bills.



OIL FILTER—Only Dodge, of the three lowest-priced trucks, gives you this feature.



4 PISTON RINGS—Only Dodge, of the three lowest-priced trucks, gives you 4 rings, instead of 3.



The Eagle Sand De-Waterer

Producing Clean Aggregate With Spiral Screw Washers

The basis of good concrete is clean aggregate. No matter how well a mix may be designed, unless the aggregate is clean good results cannot be secured. One of the leading methods of washing aggregate is with the spiral screw washer of the type made by the Eagle Iron Works, Des Moines, Iowa.

Both the Eagle gravel and sand washers operate on the same principle, removing foreign material from the aggregate by means of an upward current of water from the bottom inlets throughout the entire bed of material as it is conveyed up to the material discharge end, thus taking advantage of the difference in the specific gravities of foreign material and the aggregate. At the same time the material is subjected to an abrading action both by the screw and the bent bar agitators, the pieces rubbing one against the other, giving the aggregate a severe scrubbing. Concurrently the rising current carries the loosened foreign material to the top where it is carried back to the lower water discharge end. When the aggregate reaches the upper end of the inclined tub, the dewatering of the material is complete.

The manner of introducing wash water through the bottom inlets is exclusive in Eagle washers. Instead of a few large openings at the lower end there is a multiplicity of smaller holes extending the length of the tub, decreasing in size toward the upper end. This gives the required upward current for efficient removal of foreign material for the full length of the tub.

The amount of wash water depends upon the nature and amount of foreign material. Different conditions require diverse handling, such as more or less water, different speed of screw, higher discharge end plates or possibly elevation adjustment or difference in number of agitators. These points can not always be settled in advance but are determined readily in actual test.

New 1/2-Yard Excavator Extends Line

With the announcement of a new American Gopher 1/2-yard excavator, the American Hoist & Derrick Co., St. Paul, Minn., builders of shovels for 30 years, extends the range of sizes of the American Gopher to cover the field from 1/2-yard to 2-yard capacity.

This new Model 350, which is a crawler-type shovel-crane-dragline, with gasoline, diesel or electric power, has a number of new features, including splined shafts, anti-friction bearings, independent chain crowd, high operating speeds, and quick convertibility.

Complete details of this new shovel are contained in a new catalog which can be secured free from the company.

**TENTS
TARPAULINS
WINDBREAKS**

The Fulton line is sold through Contractor Supply Dealers in every state. A quality line priced right. Ask for SHUREDRY and FULTEX Tarpsaulins, Tents, Windbreaks.

Write our nearest plant today for catalog, samples and price list.

Fulton Bag & Cotton Mills

Manufacturers Since 1870

ATLANTA ST. LOUIS DALLAS
MINNEAPOLIS BIRMINGHAM NEW ORLEANS KANSAS CITY

Tractor Turned Submarine In Nicaragua Logging Camp

From Prinzapolka, Nicaragua, comes the story of a Caterpillar diesel Thirty-Five that played submarine as a result of the efforts of the natives to wash the bright yellow paint which had become rather mud-splattered after several weeks of wallowing in tropical ooze. The tractor was run to the log dump, a steep incline on the banks of the Prinzapolka River, where the brake was set and the bath was begun. While the Superintendent's back was turned and the natives were intent on their scrubbing operations, some Indian children climbed into the driver's seat and released the brake, with the inevitable result that tractor and children headed pell-mell for the river.

Fortunately the children jumped to safety before the machine had gained much headway, but the luckless tractor went plunging to what appeared to be a watery grave. After several days of

diving, the natives finally located the tractor in some 30 feet of water at the very center of the channel. Several unsuccessful attempts were made to salvage it, but finally heavy chains were placed around the tracks and, with the aid of blocks, rope, trucks and man power, the big machine was finally dragged onto the bank.

In spite of the fact that the tractor had been submerged for three weeks,

Paul Weaver, the tractor superintendent, felt sure that all the machine needed was a good cleaning up. He proceeded to do this with the help of his native crew. The success of the job is vouched for in the company's report, "The tractor was started back to work with no trouble whatsoever. The only apparent damage was to the paint on the hood and the machine has gone on giving no trouble of any kind."



ROAD AND SHOULDER MAINTAINERS
SPREADERS FOR STONE, ASPHALT, AND CHIPS
CAR UNLOADERS CONVEYORS TRENCH FILLERS
ROAD AND STREET CASTINGS SECTIONAL CAST IRON PIPE
THE ROSS SNOW PLOW

SPREAD STONE EVENLY-RAPIDLY

to any specified depth up to 18 in. Write for complete description and cost of a Burch Stone Spreader to fit your job.

THE BURCH CORP.,
Crestline, Ohio.

**for BETTER ROADS
at LOWER COST**

MORE AIR...AT LOWER COST...



PORTABLE COMPRESSORS

5 SIZES:

60 ... 105 ... 160

210 ... 315

Cubic Feet

**ACTUAL AIR
DELIVERED**



Available in every
type of mounting...

TOWABOUT, TRAILER, TRUCK, SKID, POWER TAKE-OFF, RAIL CAR, MINE CAR

- Feather valves
- Oil bath air cleaners
- Force-feed lubrication
- 30% reserve horsepower
- 6-cylinder Hercules engine
- Improved all-steel welded chassis

Greatest amount of air ...
for lowest fuel and maintenance cost

Air-cooled compressor lowers upkeep cost

Balanced angle design ... no vibration

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deposits ... increased valve efficiency

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PHILADELPHIA

PITTSBURGH
ST. LOUIS
ST. PAUL
SAN FRANCISCO

SEATTLE
TULSA
WASHINGTON





Riverside Drive, Memphis, Protected with Duraguard

Scenic Drive in Memphis Has Many Safety Features

The new scenic Riverside Drive in Memphis, Tenn., which will carry through traffic from the southwest and from the Harahan Bridge around the business district, was designed and constructed with the best possible facilities for insuring safe travel for the heavy traffic which this road will carry.

Wherever chance of sliding seemed probable, the steep slopes of the fills have been paved with suitable material; other slopes have been sodded. A water-bound macadam paving has been installed to prevent skidding; a lighting system, erected on concrete pedestals, has been installed to provide proper lighting for night travel.

In order to prevent reckless drivers from precipitating themselves into the river, the City Engineering Department of Memphis installed Truscon Duraguard rail. This rail has been erected on concrete posts 16 feet on centers. The posts are well reinforced with steel and set deep enough to absorb the most severe shock.

When a car strikes Duraguard, the guard plates yield slightly, then the reflex action throws the front end of the machine back, at the same time straightening the wheels so that the course of the machine is parallel to the guard. The vehicle then slides along without striking the posts or becoming entangled.

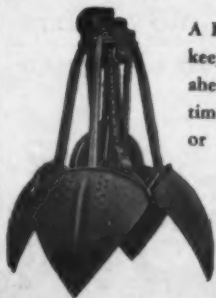
Visibility is high, for the concrete posts with a continuous band of aluminum painted steel, 12 inches wide, stand out clearly against any background, in broad daylight or dark night.

Moving Dirt 4,200 Feet in 18.1 Minutes

Some interesting figures on dirt moving speeds on the Brooks-Calloway Co. levee job near Marion, Ark., are recorded in a recent issue of *Le Tourneau News*.

The borrow pit is situated on the river side of the levee, the fill on the land side. Holes are cut through the levee at intervals to flatten the grade for the tractors, leaving however a 12 per cent ramp of 150 feet on the river side and a 15 per cent down grade to the land fill. The round trip is 4,200 feet.

WONT QUIT or cause time out



A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

The Hayward Company
32-36 Dry Street
New York, N.Y.

Hayward Buckets

Over a 7-hour period, a Le Tourneau 25-yard buggy pulled by a Caterpillar diesel Seventy-Five and carrying capacity loads of 25 cubic yards, averaged a round trip every 18.1 minutes, the time being divided as follows: 4.2 minutes to load with a 1¾-yard shovel, 7.7 minutes to haul, 6.1 minutes to make the return trip. The haul is made over a wet, sticky clay-filled soil with little bearing surface. The total yardage on this section is 6,000,000 cubic yards.

Wood Structural Design Data

"Wood Structural Design Data" by R. G. Kimball, A. T. Upson, and M. Ahern, is replete with information and tables dealing with the structural design and use of lumber. It collates for the designer much information not obtainable in any one source, a portion of which is not available anywhere. This first volume treats in logical continuity the first fundamentals with which the architect, the engineer and designer

must be acquainted to use wood structurally in a safe, economical manner.

The book contains discussions of the physical, chemical and mechanical properties of wood, a glossary and abbreviations of lumber terms, lumber quantity costs, sizes of standard yard

lumber and timber, wood beams, columns, plank and laminated floors, and references.

Copies of this 294-page book are available from the National Lumber Manufacturers Assn., 1337 Connecticut Ave., Washington, D. C.: price, \$1.00.



"GOOD ROADS" CHAMPION COMPLETELY PORTABLE ROCK CRUSHING and SCREENING PLANTS

"Efficient in production—low maintenance cost."

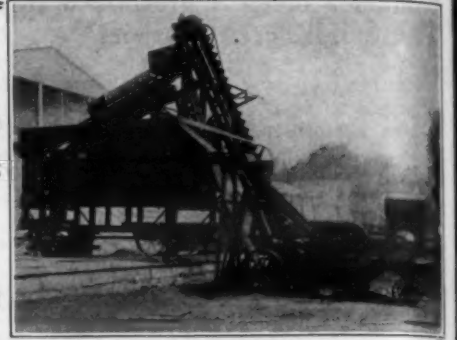
The "Two in One"

"GOOD ROADS" ROLLER-BEARING CRUSHER

REDUCING TO FINES IN ONE OPERATION

Complete plant machinery for Quarries—Sand and Gravel Pits

GOOD ROADS MACHINERY CORPORATION
KENNETT SQUARE PENNSYLVANIA



Pictured here are six new and important additions to the Cedar Rapids line. Equipment to meet every crushing, screening, or material handling requirement. Write for descriptive circulars on any equipment in which you may be interested.



40 in. by 20 in. Cedar Rapids roll crusher. Made in two other popular sizes—30 in. by 18 in. and 16 in. by 10 in.

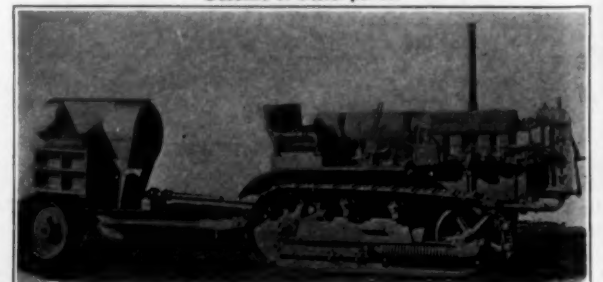
More
Complete
Than Ever
Before



Symons-Cedar Rapids vibrator screen for Cedar Rapids portable plants.



Tandem Straight Line portable plant with vibrator screen. Available in all sizes—with jaw or roll crushers for secondary reduction. Gasoline or Diesel power.



Tractor-trailer conveyer unit for roadside operation. Many other sizes and styles available.



The Cedar Rapids one piece outfit equipped with the new Symons vibrator screen—for greater capacity and efficiency. Ask us about the "Symons Changeover Plan" for present plants with rotary screens.



Standard-Cedar Rapids asphalt paving plant. Made in sizes with 300 to 3000 pound twin pugmills. Batch type plants with dryers, electric timing and locking devices—meets the most rigid state specifications.

IOWA MANUFACTURING COMPANY
CEDAR RAPIDS, IOWA

Stable Clay Fill for Bridge Approach

(Continued from page 1)

boom, maintained a 60-second loading cycle. The pit was normally dry but late in July the dry spell was broken by a series of thunder storms, necessitating the installation of a Fairbanks-Morse diaphragm pump to keep the truck runway in the pit dry.

Placing the Embankment Fill

The average haul from the pit to the embankment was 3,500 feet with a maximum of 6,300 feet. The new section that was cleared and grubbed prior to placing the embankment was slightly swampy but entirely free of muck. There was about 3 feet of loamy clay overlying the red clay of the district. The embankment section had a crown 34 feet wide with 2 to 1 slopes.

The trucks ran over the fill dumping as indicated by the foreman and the material was then spread in 12-inch lifts by a Caterpillar Sixty with a LaPlant-Choate 10-foot bulldozer. The constant trucking over the new fill, the pressure of the tractor treads, and the rolling with a 10-ton Buffalo-Springfield gas roller kept the top of the fill so hard that it shed water quickly and was ready for work far ahead of the pit. In 12 hours after the hardest rains trucks could be operated readily on top of the fill without danger of sliding off.

During the early part of the operation the pit was very dusty so the contractor placed a Fairbanks-Morse plunger pump at the edge of the river close to the fill and pumped 2,500 gph through 1,500 feet of 2-inch water line to 200 feet of 3/4-inch sprinkler hose on the fill. All material was wet down as soon as spread. This accounts for the ready compaction of the material as the trucks and other units drove over it. As the bulldozer passed over the material most frequently it was felt that it more than any other piece of equipment was responsible for the solidity of the fill. Next in importance was the constant wetting down of the material which was more effective than jetting would have been on a similar fill made direct with dragline and not compacted as built up.

In 21 working days in June the contractor produced 18,000 cubic yards of fill, borrow pit measurement, with this outfit.

Lighting the Job

As work was continued 20 hours a day, lighting was necessary for night work. The contractor mounted a Kohler and a Delco 1,500-watt lighting outfit on skids and hauled them with any piece of equipment handy to the location where they were needed. With each plant was a 20-foot pole, suitable wiring and a 1,500-watt General Electric floodlight unit mounted at the end of the



C. & E. M. Photo

The Kohler Lighting Plant, and Floodlight on 20-Foot Pole

pole. Two men, with whatever hauled the unit, could handle it readily. The men used a post hole digger and set the pole into the material at the edge of the fill and turned it so as to light the area being worked.

Approach Trestle Repairs

The repair of the approach trestles required the removal of the decking and caps of 51 panels. The caps were 10 x 12's 20 feet long and the decking was 20-foot lengths of 3 x 8-inch southern pine treated with a penetration of 12 pounds of creosote. All new material for the repairs was brought in on a spur track about 3 miles from the bridge on the north side and trucked to the site. All work was done from the north side working toward the fill at the south. Thus the first work to be completed was the repair of the approaches, and second the embankment on the south approach with its paving, so that the materials for the relief trestle could be

hauled over the bridge and the south approach embankment. The timbers were handled by a small A-frame derrick operated by hand.

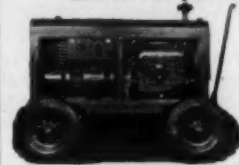
The Relief Opening Trestle

The relief opening is 800 feet long, allowing a flow area of about 6,000 square feet, and takes the place of cul-

(Continued on page 35)

UNIVERSAL ARC WELDER

Accepted for every welding job
Easy, economical operation and
the production of perfect welds
are the qualities that have won
new friends everywhere.
Let us tell you about it.



UNIVERSAL
ARC WELDERS
Universal Power
Corporation
Clarkston Road
CLEVELAND,
OHIO

GET THE SHOW-DOWN ON ROAD MAINTENANCE

THE records of thousands of miles of road-work bear witness to the money-saving possibilities of "Caterpillar" Diesel Power. The same rugged engine that drives "Caterpillar" Diesel Tractors is used in "Caterpillar" Diesel Auto Patrols . . . and, in power units, operates gravel plants, air compressors, generators, other equipment. Get a SHOW-DOWN on how it can cut your power costs. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

Near Port Royal, Pa., this "Caterpillar" Diesel Auto Patrol is making road maintenance funds do more work than ever before. Its fuel cost alone is \$2 to \$3 less per 8-hour day than that of a gasoline-powered maintainer.



CATERPILLAR

REG. U. S. PAT. OFF.

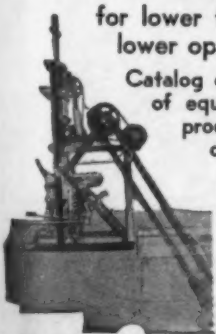
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for lower first cost and lower operating cost

Catalog of complete line of equipment for the production of concrete building units will be sent on request.



THE MILES
MFG. CO.

Jackson, Mich.

It's Also a Real Job to Maintain Roads

Care of Stabilized Roads Presents Special Problems Dependent on Weather

THAT the construction of stabilized roads is a real job was brought out in the article of that title by H. G. Sours, County Engineer of Summit County, Ohio, which appeared in the May issue of **CONTRACTORS AND ENGINEERS MONTHLY**. But the job does not end when the road is built. Mr. Sours gives us his suggestions for the maintenance of this type of road in order to keep them in first-class condition.

Wet Weather Maintenance

One of the most important questions in connection with stabilized road work is to know what to do with them after they have been built. No loose or floating material should be carried on the surface during dry weather. This acts as an abrasive material and tends under traffic to create raveling. Blading should be done only after rains sufficient to make the surface workable. Any attempt to blade while dry tends to loosen the top material; it also wastes the calcium chloride which has been drawn to the surface by capillarity during dry weather.

If wet weather is encountered soon after completion of the work there may be a tendency toward either a slippery or sticky surface. This is caused by the fact that there may be some clay on the surface which has not thoroughly compacted. Under ordinary weather conditions some of this will wear off and leave a hard surface. If it becomes slippery at first, it may be necessary to put on a light application of some kind of gritty cover material.

During wet weather a small amount of loose aggregate may be bladed in and spread over the surface; this material will bind in and help to fill any small depressions. A small amount of the shoulder soil, if of a satisfactory quality, will help to bind the loose material when bladed over the surface. If the shoulder soil is not satisfactory as a binder a small quantity of clay may be spread along the shoulder and held available for use at the proper time. When the surface again becomes dry the excess loose material should be removed by blading off lightly onto the shoulders. A combination of the cutting and building up methods may often be used to advantage.

Dry Weather Maintenance

There may be times during a continued dry period when it will be found necessary to patch some holes in the surface. Patching of a series of very slight depressions is not considered advisable but the deeper holes should be filled. A mixture of approximately 50 per cent graded gravel under 1/2-inch in size and 50 per cent sand clay together with from 100 to 150 pounds of calcium chloride per cubic yard will make a good patching material.

Chloride Maintenance

Moisture retention of a stabilized road mix is necessary to retain stability and prevent raveling. This is accomplished by periodic applications of calcium chloride. About 2 pounds per square yard per year are required. The best results are obtained by applying 1 pound per square yard in the spring when the road metal is still moist. This can be followed by one or two applications of 1/2 pound per square yard each; conditions will govern the need of re-treatments. In general, less calcium chloride is needed after the first two years.

Supercharged Diesel Truck for South American Mountains

A six-cylinder six-wheel 125-hp diesel truck, of 20-ton capacity, especially designed for use in high altitudes, was recently shipped by the Sterling Motor Truck Co. to South America where it

will be put into service by the Cia Minera Aguilar, an associate of St. Joseph Lead Co., at its mines at a height of 13,000 to 14,000 feet.

The standard motor truck loses as much as 3 per cent efficiency at an altitude of 1,000 feet and at 14,000 feet the loss is often great enough to cause a severe handicap in operations where heavy loads have to be carried over steep grades.

This Sterling diesel truck has several refinements especially designed for this type of service, among which is a supercharger by means of which air is drawn through an air filter in such quantity as to equalize for the rarity of air at high altitudes. Another feature is the combination of three Krohn differentials into a single jackshaft driving unit. Power is equally divided between the four rear wheels by means of a large differential in the center which distributes the power to two differentials, one on each side. This is also designed to eliminate wheel spinning.

Speeding Road Work at High Altitudes

Many miles of Colorado's scenic highways are through the mountains, offering vistas of great beauty to the visitor but presenting special and difficult problems to the State Highway Department.

Among the equipment used in this work are several McCormick-Deering TD-40 diesel TracTracs. At the higher altitudes prevailing in the mountains, there is less oxygen per cubic foot of air than at lower altitudes. This of course affects combustion and tends to decrease power output of any internal-combustion unit. It has been found however that the loss of power of diesel engines at high altitudes is considerably less than that of gasoline engines.

In the summer these TracTracs are used for construction and maintenance and in the winter they help to keep the mountain roads clear of snow.

KOEHRING

HEAVY DUTY 27-E autocyce PAVER



Koehring Heavy Duty construction for long life and dependability is shown in this single steel base-plate casting which supports the drum (through the drum rollers), the drum drive, the traction drive, and the traction shaft assembly. The casting is supported in the main frame at three points, eliminating the possibility of excessive strain or misalignment.

For 1935 you will need a paver having high speed production combined with low maintenance cost. You cannot afford to operate inefficient and obsolete equipment.

The Koehring 27-E Autocycle Paver is fast, efficient and dependable.

Opportunity for profit will depend upon the ability to complete your job at *lower than average* cost. The most efficient and dependable equipment is a vital factor in securing this *lower than average* cost.

Investigate the Koehring 27-E Paver.



KOEHRING COMPANY
MILWAUKEE WISCONSIN

THE FAMOUS GIANTGRIP STRAIGHTEDGE

Either Steel or Aluminum

Formed straight under tremendous pressure on rubbermill presses, it STAYS straight. Two usable edges—one sharp-cornered and squared for scraping; the other rounded for line-point straightening.

Write for circular

L & M

Manufacturing Company

Largest Exclusive Manufacturers of Paving Road Tools
16342 BEREA ROAD, CLEVELAND, OHIO

Composite Pile Trestle Structure

(Continued from page 5)

capped with a 26-gage galvanized iron sheet on which the 24-foot timber cap 14 x 12 inches in section was placed.

The Floating Pile Driver

The pile driving barge was 30 x 70 feet in area with a 5-foot depth and 34-inch draft, and carried the 85-foot structural steel tower which carried the pendulum leads of the same length. The leads, pivoted at the top, could be swung to give the required batter by inserting pins through the yoke at the foot of the leads. The piles were driven in a predetermined sequence. With the piles numbered from left to right they were driven as follows: 1, 5, 4, 3, and last 2. A Warrington-Vulcan No. 1 steam hammer weighing 9,600 pounds was used for driving. The steam equipment on the barge consisted of a 60-hp boiler and 3-drum Lidgerwood hoist and an auxiliary 40-hp boiler and 2-drum Lidgerwood for handling the barge. The anchors were placed 300 feet out on either side forward, a line was carried to a pile cluster forward and there was also a stern anchor. This pile driving outfit was built especially for this contract as the one with which the work was started had 60-foot leads so that the untreated portion of the composite pile was driven first. Then the treated portion was picked up, placed squarely on the butt of the untreated pile, the splice made in the leads and the composite pile then driven to its final position. Too much time was lost making the splice in the leads so the 85-foot lead pipe driver was built so that the composite pile would be driven as a unit. Two pile barges served the floating driver so that one could be loaded while the other was being unloaded.

The operating crew for the pile driver which worked two 6-hour shifts a day for five days a week consisted of: the foreman, a loftman, a leadsman, a winchman, the operator, a fireman, two pile driver hands, and two deck hands. This crew averaged twenty-five piles or five complete bents a day.

Driving the Piles

A 1½-inch steel pile plate was fastened to the pile head by a ¾ x 9-inch spike through a hole in the center of the plate to prevent the ram from brooming the pile head during driving. As the strata penetrated were very uniform it was very much of a gamble just where to cut off the untreated piles to get the proper penetration of the splice, the proper bearing for the pile and yet not be penalized for over-driving. The contractor ordered the untreated piles about 4 feet longer than indicated by test piles driven at 500-foot intervals to be sure of having sufficient

(Continued on page 27)

Analysis of Bridges Without Higher Mathematics

Brief but clear and complete enough to enable designers of bridges to analyze rigid frame bridges quickly, the new edition of "Analysis of Rigid Frame Concrete Bridges" has many new features and information on the results of recent studies.

In addition to analysis by moment distribution, a new chart and a new formula are given as the basis of a procedure by which moments may be determined quickly without the use of frame analysis. This new procedure is valuable for use in making preliminary designs or in checking moments obtained by frame analysis.

A simple method of correcting moments in frames by allowing for deck curvature is presented, and important structural details used in rigid frame concrete bridges are added. There is also a new convenient method of determining stresses in double-reinforced

concrete sections subject to combined bending and axial thrust.

Copies of this 40-page booklet are available gratis by writing to the Port-

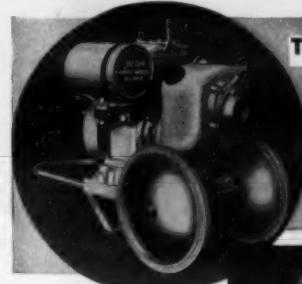
land Cement Association, 33 West Grand Avenue, Chicago, Ill., and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

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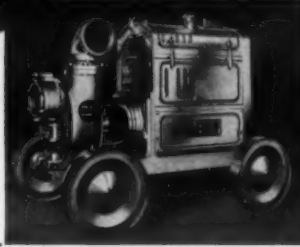
Left: "BANTAM WEIGH," 8500 Gal. Portable Pump



The "Handy Model"

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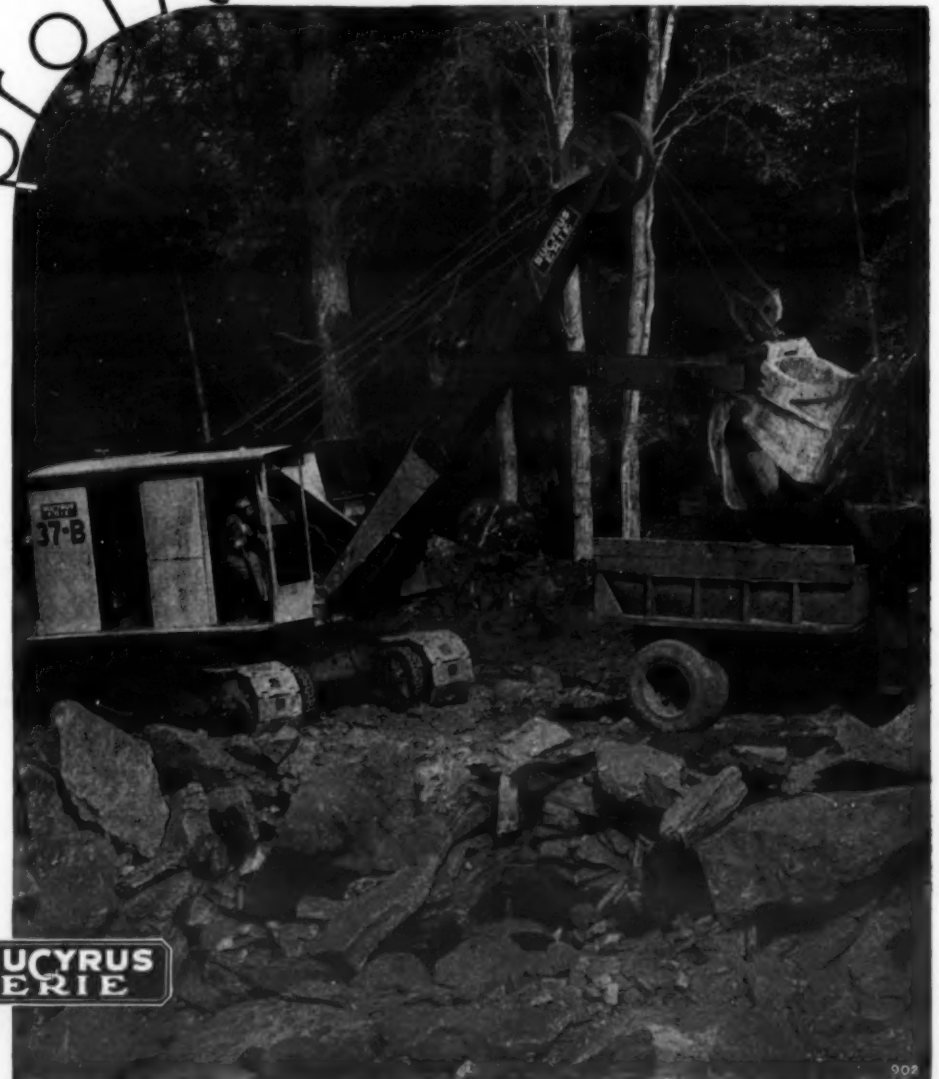


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Dredge Manatee Delivers the Goods

(Continued from page 12)

the design of this dredge was the adaptation of the "pilot clutch", as used on some dragline machines, to the operation of the main friction drives on this hoist. With the use of this self-energizing arrangement, the friction levers are very easy to operate, and ample power for operating the friction drives is provided. The use of the pilot clutch makes unnecessary the use of air rams to operate the friction drives. There is a considerable saving in first cost and in maintenance. Moreover the pilot clutch enables the operator to "feel" the pull on the lines, and to set the frictions just tight enough to hold the load but not so tight but that an excessive load will cause them to slip, thus tending to prevent breaking lines and heavy shocks on the machinery.

The Dredging Pump

Immediately aft of the hoist in the forward machinery well is a Bucyrus-Erie 18-inch dredging pump with a special horizontal stuffing box on the front side of the impeller to seal against any by-pass water. Timken roller bearings are used to take the radial and thrust loads. There is a Cutler-Hammer magnetic clutch between the main engine and the pump. A Westinghouse 175-kw generator at 220 volts direct current is mounted on the line shaft between the main engine and the pump. The main engine is a 1,000-hp Busch-Sulzer Type-E air-injection 8-cylinder 2-cycle diesel engine operating continuously. Placed immediately behind the main engine is a 300-hp Busch-Sulzer solid-injection 4-cylinder 4-cycle diesel engine direct-connected to a 200-kw 220-volt direct current Westinghouse generator which, under ordinary conditions, supplies all necessary power for driving the cutter motor, hoist, auxiliary pumps and other auxiliaries.

However, in case the digging is heavy and the cutter motor requires an excessive amount of power, part of the auxiliary load can be thrown onto the 175-kw generator driven by the 1,000-hp engine. All the larger motors are connected to double-throw switches on the switch board, and this enables the engineer to distribute the load between the two engines as desired. If the cutter load is not too heavy, the whole load can be thrown on the main engine, thus enabling the 300-hp engine to be shut down for repairs or adjustment. This procedure usually involves a restriction of the output of the dredge because it requires

that the main engine be slowed down or that a smaller diameter impeller be put into the pump in order to prevent overloading of the engine.

A vacuum of about 12 inches shows on the operator's gage when the suction line is carrying only a water load, but when working in heavy material it may run as high as 25 inches. An operator must learn all of the various combinations of readings of the pressure and vacuum gages as he can not see the area in which he is digging as it is all under water and invariably muddy, but the gages show if there is a choke in the suction or discharge line, if there is a break in the line, whether the cutter is fouled, and many other important features of operation.

The Auxiliaries and Pumps

The main power plant is located in the machinery well but there is plenty of room on either side for the installation of all the accessory units required for the efficient operation of the dredge and still leave a companionway above the well on either side. Careful planning has produced a dredge with ample room for every man to move around in carrying out his duties and with the minimum opportunity for accident or injury from low beams or small auxiliary units mounted in the companionway.

A Caterpillar Fifty diesel power plant direct-connected to a 30-kw Westinghouse 220-volt direct current generator serves as a standby lighting plant when the main electric plant is not running. It supplies sufficient power to raise the ladder or spuds and to operate the electric welder and machine tools, and thus saves starting the larger unit solely for minor operations.

A 6-inch, 3-stage Hill centrifugal pump driven by a 50-hp variable-speed

(Continued on page 30)

Concrete Bridge Details

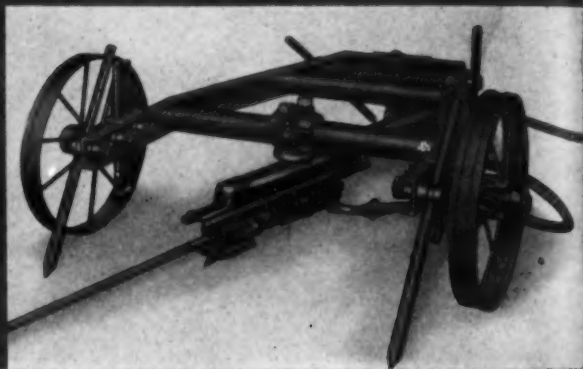
A critical discussion of concrete bridge details based on recent extensive field observations is contained in a new 48-page illustrated booklet which was reviewed before publication by several leading bridge engineers and which presents observations with a spirit of open mindedness and offers constructive suggestions for improved details. Among the subjects discussed are abutment movements; wing walls; bridge seats; bearings; expansion joints; prevention of seepage; wearing surfaces; hand railings; construction of approach slabs; and creep in skew bridges.

For the first time in concrete literature, proper emphasis is placed on the correct treatment of details. The purpose is to improve construction of con-

crete bridges which ultimately produces the desired quality: longest life with the least cost of upkeep. Copies of this

booklet may be secured from the Portland Cement Association, 33 West Grand Ave., Chicago, Ill.

For Drifting Drill Speed on Jackhammer Jobs Use the Gardner-Denver Universal Mounting "A TRIPOD ON WHEELS"



● Down holes, snake holes, toe holes—holes close to the face or close to the floor—all can be drilled at any angle from the Gardner-Denver Universal Mounting.

The easily adjustable post and arm make it possible to swing the drill into any position, by loosening a few nuts.

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Heltzel Rigid Radius Forms are made in sets and to any radius required, for curb, sidewalk, or combined curb-and-gutter construction. Their initial low cost makes them an economical investment!

In cutting back and widening dangerous corner intersections, this Heltzel equipment is ideal, saving in time, labor and money!

Write for Bulletin 200, describing complete Heltzel line.

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Portable Lubrication Unit Maintains Equipment for Kansas Contractor

A successful portable system for the lubrication of construction equipment has been adopted by the List & Clark Construction Co., of Kansas. This company, which operates extensively in the western part of that state, has experienced considerable difficulty with the dust and sand so prevalent in that territory these past months. Many men and much time were used in carefully lubricating the vast array of shovels, graders, dump wagons, tractors and other equipment owned by this contractor. The cost of operation and labor was mounting, and expensive machinery was endangered, due to the difficulty of keeping the equipment properly lubricated.

To solve this problem, a simple but effective lubrication unit was constructed and mounted on a 1½-ton truck,



The Lubricating Outfit Used by List & Clark

consisting of an Alemite Power Lubrigun, a small compressor operated by a gasoline engine, an electric light plant, oil barrels containing different grades

of oil, and a storage tank for lubricant. With this outfit, List & Clark has been able to lubricate all its construction equipment at night, the truck mounting

making it possible to move rapidly from one piece of equipment to another.

The Alemite Powergun equipment is a new development, designed to do away with inadequate, slow and costly lubrication. Mounted on a truck or trailer, the outfit is easily portable; few men and little time are required to handle all the lubrication necessary; and the tons of pressure necessary for proper lubrication are ever ready at the operator's finger tips.

Equipment Division Announced by Blaw-Knox

Blaw-Knox Co., Pittsburgh, Pa., has announced the formation of a Construction Equipment Division, merging the Road Equipment Department, Clamshell and Dragline Bucket Department, Dirt Moving Equipment Department, Bin and Batcher Department and Truck Mixer Department. This centers these interests under Robert T. Harris, Manager, assisted by the former departmental personnel.

Consider THE WHOLE UNIT

"We ain't hollering about no one gadget or feature." After all, every part that goes in Link-Belt machines must be a champion performer. Link-Belt tolerates nothing but the best throughout the entire structure. When choosing, it's the quality of the entire unit that counts.



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SHOVEL-CRANE-DRAGLINE

Relief Employment Hits Skilled Labor

(Continued from page 1)

entiate between a man on relief in X County and a man on relief in Y County. It is simply the case of one man on relief. The experienced skilled laborer is permanently established, is a definite part of an organization, trained by the contractor and in many instances carried through the non-working periods with funds or a job created solely for the purpose of keeping the organization intact; there is nothing to be gained in placing this man on his local relief roll and in his place on a job which the contractor is running in another county, placing an unskilled, inexperienced and careless man in the skilled man's job simply to relieve the unemployment situation in the community where the particular project is located. Nothing has been gained by shifting this burden of employment from one county to another. In fact, this procedure actually penalizes the man who has spent years of conscientious effort in becoming efficient in his work as a skilled laborer or operator of equipment and presents his job to an incompetent unskilled individual.

Local Labor Predominates

To prove that it is reasonable to consider the state as a whole, look at the following facts from the Illinois State Highway Department. In 1933 when the contractor was free to select his labor where and as he pleased, and was in no manner concerned or hampered by employment agencies, of 32,044 laborers employed by contractors on Illinois highway projects 89 percent were local residents living within the vicinity of the job, 10 percent were non-local, but residents of Illinois, and the remaining 1 percent were non-residents of the State. These figures include executives, administrative, skilled and unskilled employees. Is this not evidence that if the contractor is not hampered by employment agencies he will, of his own volition, keep his labor requirements confined within the boundaries of the state in which he is operating?

Trained Operators Necessary

The contractor uses highly specialized equipment, designed and built for his specific purpose, and requiring skill and ability to operate it properly. There are certain classifications of labor on paving, bridge and grading work that, under no circumstances, can be properly filled by untrained local citizens. No contractor can go into a rural community, and build a complicated highway project, using local labor, and keep within the limit of his estimate. There is not one of us who has not either tried it and

hopelessly failed, or who has not had first hand observation of a failure by other contractors.

Untrained Labor Costly

On small projects, under the present set-up, the job invariably is completed before the new laborers have actually become acquainted with or adapted to their respective duties. Consequently, the job is a disintegrated mad house from start to finish. On projects that are large enough to be prolonged over an appreciable period, hiring, rehiring, instruction, delays from discharging, and the general inefficiency takes up so much time that equitable progress is impossible. Case after case of overrun of completion dates are today quite common.

Quality of workmanship and final results are receiving no end of criticism from the Highway Departments. The Departments are inclined to be as lenient as the ethics of their positions will permit. They have certain standards of excellency which they strive to maintain, but the disintegration of the dependable

labor structure is wrecking these standards.

The Penalty the Contractor Pays

Our company's equipment maintenance costs have actually doubled since we have been under the relief employment agency's regulation. This condition has been carefully checked with contractors over the entire country, and their figures uphold ours. A very reputable grading contractor reports that his maintenance costs have increased 6 cents per cubic yard of earth excavation. Surely there could be no intent of loading such a burden on any industry. Local labor is wrecking expensive equipment, while efficient operators remain in their home communities idle and begging for jobs which rightfully belong to them. Nothing has been gained, no relief of unemployment has been accomplished. In addition, this condition has destroyed the incentive and the desire of the skilled laborer to be efficient. The trained man realizes that his opportunity for work is confined to a limited area, and the man from the employment agency realizes

that when this particular project is completed his career as a highway employee is at an end.

(Continued on page 29)

Light Up Your Job

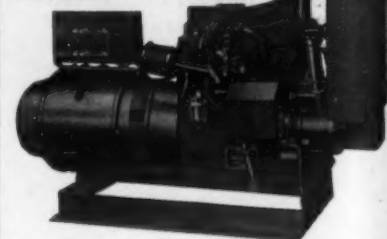
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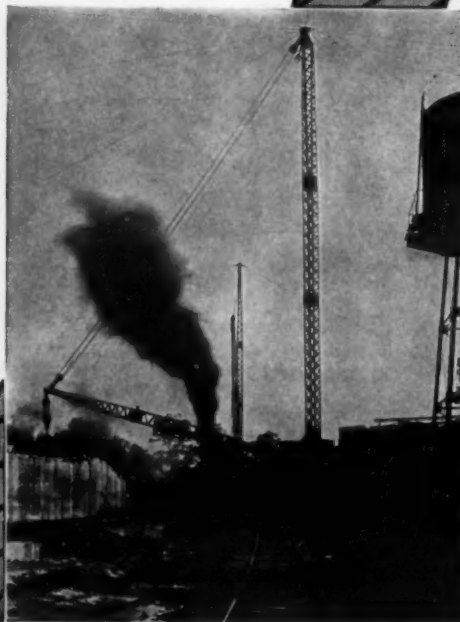


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C. & E. M. Photo

A New Road Roller to Eliminate Bumpometer Bumps

A New Extension Road Roller To Keep Bumps Out of Asphalt

It was prophesied nearly a decade ago that when highway officials and the manufacturers of asphalt paving equipment wrote specifications and built machines that produced pavements as smooth as the more expensive types, then bituminous paving would receive the recognition of the public. That time seems to have arrived. We now have 10-foot specified straight-edges for checking the pavement and Ohio demands not more than $\frac{1}{4}$ -inch bumps in 10 feet in its hot-mix, hot-laid pavements. The asphalt finishing machine has done much to bring about smoother, more uniform texture hot-mix pavements and steps have been taken to provide roller equipment which will complete the job.

A new 10-ton extension roller has been placed on work in California and Ohio by the Buffalo-Springfield Roller Co. of Springfield, Ohio. The new machine has four wheels, the new fourth wheel being placed ahead of the standard front roll and the machine has a wheel base of 16 feet $3\frac{1}{4}$ inches. The two front rolls, one behind the other, steer on the same radius, and one or both of the front rolls are always in contact with the surface; hence, the machine is steerable at all times. An in-

dicator on the king pin of the front roll shows all bumps in the pavement so that the roller man knows just what he is doing.

The diameter of the two front wheels is 36 inches and both are 40 inches wide. The rear wheels are 60 inches in diameter and 20 inches wide with an overlap of $\frac{1}{4}$ inches over the front wheels. All four rolls are machine faced to insure uniform smoothness.

This extension roll machine has a compaction of 100 pounds per linear inch more than a standard 10-ton tandem roller.

It is interesting to note that on the first job on which one of these rollers was used in the east, on a state highway in Ohio, in the first mile of rolling there were only two bumps. The first was at a hand-raked street intersection and the other at a catch basin near the curb where it was not deemed advisable to run the new roller over the casting.

Another observed feature was the actual added pressure exerted by the second roll when it rested on a high spot. The roller was in reverse, stopped and started forward with the second roll on a high spot. The first roll, clear of the pavement by a small fraction of an inch, continued to turn in reverse until the machine moved forward a few inches and the front roll reached the surface again. Then it stopped and started to roll forward with the machine.

New Roadside Crushers Handle Oversize on Job

A new portable roadside crusher for road maintenance and construction which enables the user to reclaim valuable supplies of oversize with economy has recently been announced by the Iowa Manufacturing Co., Cedar Rapids, Iowa.

This crusher, which is particularly designed for use in maintenance and the construction of low-cost gravel roads, is a self-propelled plant which can be quickly and easily moved from one location to another. The crusher and tractor are built into a single unit. The crusher is set ahead of the tractor and is fed by a front-loading power-driven skip. Aggregates to be crushed are windrowed in the middle or near the side of the road. The tractor then drives the skip into the windrow until it is fully loaded. The skip is then raised by tractor power and its contents discharged into the crusher.

When crushed the aggregates drop onto the road where they are available for spreading. Since the bottom plate of the skip is perforated, only material of the correct size drops through onto the road, the oversize being delivered to the crusher.

These Models 912 and 916 units with skip feed are 29 feet long, 5 feet 6 inches in width, and 11 feet 4 inches in height, overall measurement. The skip capacity is $\frac{1}{3}$ yard.

The same size crusher is also offered in a portable tractor-driven unit of the

hand feeding type and the 916 crusher is available in a trailer unit for use with a crawler-type tractor.



The Pony Clamp

Novel Steel Bar Clamps

Pony bar clamps, which are so designed as to make ordinary $\frac{3}{4}$ -inch steel pipe serve as the bar, are made by the Adjustable Clamp Co., 427 No. Ashland Ave., Chicago, Ill. The pipe may be either standard or extra-heavy, with American or British pipe threads. The clamps may be secured complete, or the fixtures only may be obtained and used with pipe on hand. No tools of any kind are needed to apply the fixtures.

Adjustment is secured by the multiple disc clutch which grips the bar automatically at any point and permits fitting the clamp to the work, the screw being required only to apply pressure. The foot is never loose on the bar, but is easily released by finger grips. The castings are of malleable iron, the clamping faces $1\frac{3}{4}$ inches square. The screw is of cold-drawn steel $\frac{5}{8}$ -inch in diameter, with deep coarse threads. The handle is one-piece and indestructible.

This company makes a complete line of clamps, of which the Pony is only one, all of which are described in Catalog No. 10 which may be secured direct from the company.

This is the unit that ETNYRE built

to improve an already remarkable line of bituminous distributors

1. A more compact assembly of pump, valves and circulating system reduces the weight about 300 pounds, permits the unit to be mounted 4 inches lower on the truck without reducing the road clearance of the spray bars, makes insulation easier, and allows the valves to be readily heated from the motor exhaust.
2. The new leakless valves eliminate the drip-drip which has up till now been so annoying to operators.
3. The new fifth-wheel-driven tachometer is proving more accurate and satisfactory than either front-wheel or transmission drive. The fifth wheel is raised, when the truck is on the way to or from a job.

504—Write just this number—504, on a post-card, with your name and address, and we shall be glad to send you a copy of our Bulletin No. 504 which will give you further interesting facts concerning this new ETNYRE.



E. D. ETNYRE & CO.

DEALERS IN ALL PRINCIPAL CITIES

400 JEFFERSON ST.,

OREGON, ILL.



MODEL FO2

Methods of Driving Baltimore Tunnel

(Continued from page 8)

muck was carried back in two trains of three 2-yard cars running on two narrow-gage tracks to the shaft. Before the open cut at the Washington end was completed, these trains of 2-yard dump cars were taken up on one of the electric elevators and dumped into the hopper for truck disposal as described for the side-drift mucking.

After the Washington end open cut was completed, the muck was loaded by the mucking machine into 2-yard bottom-dump boxes, one of which was mounted on each industrial car. These were run back under a gantry which picked them up and dumped them into a 30-yard Western air-dump full-gage railway running on a track set along the center line of the tunnel. These cars were hauled out by an electric locomotive to the portal where the Pennsylvania Railroad picked them up and disposed of the muck on a railroad dump.

When the side drifts were holed through to the Philadelphia end, mucking of the main tunnel was handled by trains of two cars with one Whitcomb locomotive for each train, running through the two drifts outside the tunnel where a Lorain 75A crane picked up the bottom-dump boxes and emptied them into a hopper from which trucks hauled the muck for disposal. This method of mucking was used for the last 200 feet of the main tunnel.

There were six muckers working on the invert of the tunnel. Their work consisted of grading ahead of placing steel and concrete in the invert.

The Machine Shop

A very complete machine shop was set up on the job on a street which was closed off to through traffic. The shop consisted of a galvanized house 45 x 14 feet, housing an Allis-Chalmers 40-horsepower electric motor which drove the jack shaft for operating the 18-inch American lathe, a power hack saw, a 14-inch Barnes drill press, a Greenfield bolt machine, and a grinder. The equipment also included K & G oxyacetylene cutting and welding outfits, which were used frequently. The shop was able to make repairs on practically all equipment used on the job and also to make fittings for certain parts of the equipment.

Concreting

The sequence of concreting, exclusive of grouting operations, was as follows: 1. pouring the footings and wall sections in the two drifts; 2. pouring the invert and 3. pouring the sidewalks at the spring line of the tunnel section.

All concrete was furnished by the Arundel-Brooks Corp., a subsidiary of the general contractor, which maintained a batching and central mixing plant on the water front about 2 miles from the Valley Street shaft. The concrete was fully mixed in a 5-yard mixer at the central plant and placed in 4 or 5-yard Rex Moto-Mixers to be hauled either to the Valley Street shaft for chuting to the hopper car in the tunnel or to the Rex Pumpcrete machine which was set up successively at 200-foot intervals along the drifts.

A most ingenious method was used to deliver the concrete to the drifts for pouring the walls and footings. The contractor put down 10-inch well drill holes every 200 feet ahead of the drifts and inserted 6-inch steel pipe in these holes through which concrete was delivered by the Rex Pumpcrete. The steel forms were set for the face of the footing and side wall only, using the liner plates as the forms for the base and back of the wall. Six or seven liner plates of each ring were thus left in place, the remainder being salvaged for use ahead.

The Pumpcrete has a capacity of about 25 yards per hour in placing concrete. The footing and wall sections poured by this machine required 4 yards of concrete per linear foot. The Pumpcrete unit was set up at an appropriate elevation on cribbing near the pipe leading to the drifts and a heavy wooden ramp carefully constructed up which the Rex truck mixers backed and delivered the mix to the top of the concrete pump, in charges of 1 cubic yard each.

All concrete for the main inverts was delivered by the Pumpcrete in the same way in which concrete was delivered for the wall and inverts in the side wall drifts. The concrete for the walkways was delivered by the truck mixers to a hopper at ground level at the Valley Street shaft. Semi-circular chutes carried the concrete down to a control hopper at the bottom of the shaft which delivered to three side discharge hoppers of one yard capacity each, mounted on a

standard gage railway car. These hoppers were run along the tracks until the section of the walkway to be poured was reached and the concrete chuted direct into the forms.

Labor Organization and Shifts

The total number of men for three shifts on the shield tunnel was about 350, as a maximum.

Personnel

The contract for the new Union Tunnel of the Pennsylvania Railroad was awarded to the Arundel Corp., Baltimore, Md. The work was under the direction of J. V. Hogan, President and C. W. Black, Chief Engineer, with W. G. Armstrong as Resident Engineer and Harry Redwood, Superintendent. For the Pennsylvania Railroad, the project was under the direction of W. D. Wood, Engineer of Baltimore Improvements for the railroad with D. A. Leisher as Resident Engineer. James Forgie of New

York was Consulting Engineer for the Pennsylvania Railroad on this tunnel project.

10,000 Low-Priced Trucks To Be Built by White

A new streamlined Indiana truck in the low price field, 10,000 of which will be built this year, has recently been announced by the White Motor Co., Cleveland, Ohio. This new model, of 11,000 pounds gross capacity, is designed to fit the requirements of contractors and highway departments for light-duty trucks.

Modern streamline appearance is a feature of the chassis, achieved by the use of deep-skirted fenders, cadmium-plated radiator grille and louvers, and a sedan-type cab. Other features are a powerful 6-cylinder 263-cubic inch engine, hydraulic brakes and ventilated disc wheels.



Here is something more than a new hauling unit... it is an entirely new method of moving dirt... at faster speeds and at lower cost than has ever before been possible. The new Allis-Chalmers Speedster hauls 6 to 8-yard loads... at speeds ranging up to 16 miles an hour. Turns "on a dime" for quick easy spotting. Works anywhere... in loose dirt, sand, gravel, rocks, gumbo, on steep slopes. Big, low-pressure tires roll over ruts and bumps, providing ample traction and efficient use of power. A single-unit hauling outfit... designed and built specifically for dirt hauling... powered by a proven tractor engine. Contractors who have used the Speedster say it beats anything they have ever seen for high speed dirt moving. Why not be among the first to take advantage of this better way to move dirt?

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

Lawrence Machine & Pump Taken Over by V. J. Mill

Victor J. Mill of Baldwinsville, N. Y., has purchased the Lawrence Machine & Pump Co. of Lawrence, Mass., and will continue to operate it under the name of Lawrence Machine & Pump Corp. This company, which was established in 1882, made the first centrifugal pump in the United States, and at its peak shipped 1,000 to 1,500 pumps annually to all parts of the world.

Mr. Mill, who has been prominent in the industry for nearly 20 years, plans to continue the Lawrence line of pumps, with many new improvements in design. The line will include centrifugal pumps for a varied field, including single and multi-stage water pumps, stock pumps, sewage and sludge pumps, chemical pumps and sand and dredging

pumps. In addition the plant will build hydraulic dredges and special machinery, a field in which Mill has had wide experience.

A graduate of Sheffield Scientific School, Mill's practical experience covers four years with the General Electric Co., two years as field engineer on hydraulic construction with Jas. Stewart & Co., a year as field engineer on general construction with Standard Oil Co. of New Jersey, and 19 years with Morris Machine Works, the last eight years of which he served in charge of engineering and sales and as a director of the company.

Speaking of safety practices, one company said recently: "Our experience has been that whenever we made a job safe we also increased production from 15 to 150 per cent." Just another reason for practising safety.

New Shot-Firing Cords

Two new types of all-rubber shot-firing cords, both of which because of their small diameter, flexibility and light weight are of interest to the operator who is required to carry long lengths on the job, have been announced by the Merchandise Department of General Electric Co., located at Bridgeport, Conn. One of these cords is a round type, the other a parallel-type cord and both have a red rubber finish.

The round-type cord is especially suitable for battery shooting in wet or damp places. Its all-rubber construction makes it resistant to abrasion and mechanical injury, as well as to the action of oil, acid or gas.

The parallel-type cord is of flat rubber construction and provides satisfactory service under ordinary conditions where initial low cost is a factor.

If Your Engine Fails

Tips on Trouble Hunting for One of the Causes of Truck Breakdowns

By FREDERICK W. KOERBER

ENGINE operation depends upon three principal factors: uninterrupted fuel supply; constant ignition; and adequate compression. It is a well-recognized fact that engine trouble never occurs at a convenient time or place, and it therefore behooves truck drivers to know something about "trouble shooting" to meet such emergencies, as well as to save many dollars for the owners of the trucks.

If a truck engine has been running satisfactorily and then suddenly stops without any noticeable cause, it means either the fuel supply has been cut off or the ignition has failed. The first step is to determine which of the two is at fault, assuming of course that the operator hasn't just run out of gas.

If the fuel tank is in proper order and filled, proceed with the next check. A common cause of fuel system trouble is the excessive use of the choke in starting the car which results in flooding the cylinders with unvaporized fuel which, consequently, will not fire. Another evil of this practice is the contamination of the crankcase oil with the raw fuel which acts to break up the body of the oil, thus reducing its effectiveness for lubricating purposes.

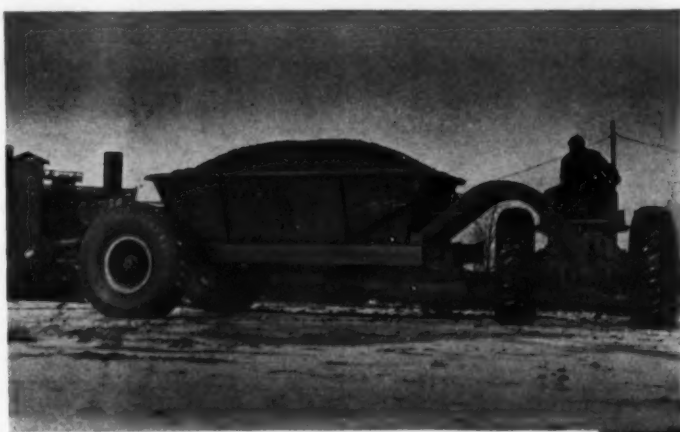
To test for flooded cylinders, set the choke in "Running" position, and crank the engine about ten seconds with the throttle partly open. If the ignition is not at fault and the engine still does not fire, it can safely be assumed that the cylinders are not flooded with raw fuel and the difficulty must be with the fuel flow, the test for which follows:

Test for Faulty Fuel Supply

1. Open the carburetor drain cock or loosen the drain plug of the fuel pipe at the carburetor. If the gasoline flows in a steady stream, the remainder of the fuel system is not at fault.
2. Sometimes water or sediment in the carburetor will cause the engine to stop frequently, due to the interruption of a steady flow of fuel. Clean the carburetor to insure against this danger, then clean the drain cock with a piece of wire.
3. Test the fuel pipe by disconnecting both ends and blowing through or by using a tire pump to force the dirt out.
4. Remove the strainers in the carburetor, the vacuum tank and the fuel tank, and clean.
5. Test the vacuum tank by removing the plug at the top and filling with gasoline. Clean out air vent in vacuum tank, if clogged. If, after this supply has been used up, the engine stops, then check further as follows:
6. See that the suction pipe from the vacuum tank to the carburetor is not loose, for this will prevent the operation of the vacuum tank itself. If the suction pipe be found loose, tighten all connections and apply shellac or soap to prevent air leakage.
7. If the carburetor drips gasoline continuously, either the carburetor float needle valve is clogged with dirt or the float has sprung a leak. The first step is to drain the carburetor and clean out the screen that is provided to catch the sediment. Next remove the float needle cap and raise or depress the needle to cause excess flooding; then twist the needle against seat. Start engine. Carburetor should then function properly unless the vacuum tank float leaks.
8. If flooding of carburetor continues, a leak in the tank float is undoubtedly the cause. In this case, the leak must be repaired or if too badly damaged, a new tank float will be necessary.
9. In order to get the truck to the company's shop or a nearby service station, where the repair or replacement can be made, disconnect the suction pipe to the intake manifold, plug the manifold connection, fill the vacuum tank through the filler plug and then drive to destination.
10. See that the carburetor choke control connection is properly adjusted and tight.

The above check will reveal the difficulty in the fuel supply, if that is the source of the trouble. If, however, the fuel supply is found not to be responsible, the next possible causes to investigate are the ignition and compression. The procedure for checking these will appear in subsequent articles.

"Highway building is a dynamic and continuing responsibility. Highways grow better or grow worse. They can not stand still with twenty-five million motor vehicles in daily operation."



Turns in its own tracks . . . at greater than 90 degree angles. Independent clutches and brakes permit quick spotting for loading and speedy action at the dump. High arch permits tractor to undercut.



Big, low-pressure tires have large area in contact with the soil, providing ample traction for big loads, steep slopes and rough going. Exceptionally low hitch aids traction and ease of control.



Hauls 6 to 8-yard loads at speeds up to 16 miles an hour. Four speeds forward—2.5 to 3.7, 5.8, 10.5 and 16. Less dead weight means greater pay loads and higher speeds.

ONE MAN UNIT. One man operates the Speedster unit. Braking, dumping and loading operations are vacuum controlled from the tractor dashboard. High clearance eliminates "raring up" on the dump. Low hitch prevents tractor "raring". Cushion hitch provides stability with flexibility.

THE NEW SPEEDSTER

Excavation— Wet and Dry

(Continued from page 2)

Cofferdams

Cofferdams for the work to be excavated in the dry were started in the summer of 1932 and were finished in 1933. They were built with rock secured from disposal areas and with clay dredged from the river bottom. When they were unwatered, some leakage was found, mostly at the bottoms, but this was largely overcome by trenching along the lower outside face of the dykes and filling in with straw and clay. Deep water and a fast current challenged the skill and resourcefulness of the contractor.

Dry Excavation

Dry excavation on Section B was started in December 1932. After the cofferdam was unwatered by the pump-scow, some loose material was found as a result of previous submarine shots. This was removed by stripping before excavation started. Then holes were drilled about 7 feet deep on 5 x 5-foot centers. When a sufficient number of them were loaded, usually from 300 to 600, all charges were connected in parallel series and the shot fired electrically from a power circuit.

The broken material was removed by two draglines working side by side, but with the one near the center of the cut slightly in advance of the other. The leading machine, with a 3½-yard bucket, cleaned a strip 150 feet wide, casting the material toward the side. Then the larger unit with a 6-yard bucket and a 175-foot boom, picked up and carried the rock outside the cut, dropping some of it on the dykes. The dykes were not permitted to exceed a height of 10 feet above the surface of the river, so small draglines and bulldozers leveled them off.

Very little secondary blasting was needed, except in a few cases where the rock ledges outcrop. Sometimes, after a shot, the men found pieces of stone slab too large for the draglines to handle. These were broken down with jack hammers.

Considering weather conditions and the difficulty of building cofferdams in deep water, this work has progressed very satisfactorily. Sections B and D are finished and the plant is now moved into Section E.

In the Wet

While some of the wet work was started in 1932, it did not actually get under way until early the following year. The method of operation on these sections has been to use the customary drill-boats drilling holes on centers ranging from 8 x 8 feet to 10 x 10 feet to a depth of 34 to 36 feet below mean water level. When the dynamite was loaded, the boat pulled away to a safe distance, and the charges were fired in

ranges.

A dipper dredge of 8 cubic yards capacity moved up to gather the broken material, loading it to scows which were towed by tugs to the dumping grounds. Sweep-scows next worked over the excavated area to determine if there were any high spots, and if any were found, they were removed. Section A is drilled and blasted, while C is finished, and F is drilled and for the most part excavated.

Handling Dynamite

The dynamite used by the contractor was shipped to Amherstburg, Ontario, where it was transferred to scows and carried across the river to Powder House Island. Daily, service boats delivered du Pont explosives to the various work locations.

Personnel

The Arundel Corp., Baltimore, Md., was the successful bidder for this contract. The operation was placed in charge of E. S. Johnson, Superintendent and J. N. Shlessinger, Engineer. Arundel

decided that the material in three sections could best be excavated in the wet and that cofferdams would be built for the dry excavation on the other three sections. The construction of part of the cofferdams was sublet to Dunbar & Sullivan Dredging Co. and the excavation in the dry was sublet to George Mills & Co., another Detroit contractor. The Arundel Corp. elected to handle all of the subaqueous rock excavation itself, and used its own fleet of drill boats, tugs, dredges, sweep scows, dump scows and other floating equipment.

The material and illustration for this article are used through the courtesy of du Pont Magazine.

Crane Co. New Dealer for Bucyrus-Erie

The F. C. Crane Co., 1301 S. Lamar St., Dallas, Tex., has been appointed distributor for Bucyrus-Erie power shovels, draglines, cranes, clamshells and skimmer scoops in the central and eastern sections of Texas. In addition to new excavating equipment from ¾ to 2-

cubic yards capacity, the Crane Co. will also carry a complete stock of repair parts for all current machines as well as the older types of small machines.



**Price Only
\$175**

This machine weighs 140 pounds—easily transported to the job.

Resharpen Your Rock Bits

with a Quick-Way Bit Grinder. Resharpen them again and again at a cost of from 2c to 4c per bit.

C. H. CARLSON MFG. CO.
13-15 Main St. N. E. Minneapolis, Minn.

SHOVING COSTS DOWN

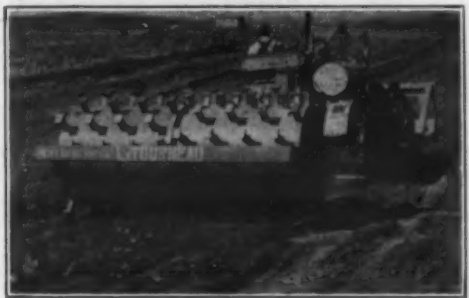
With Le Tourneau
Equipment
Is Easy



The versatile LeTourneau Angledozer on a highway job



(Above) A typical Carryall Scraper load
(Below) Sheep's Foot Roller on a reservoir fill



Easy because LeTourneau Equipment moves more yardage and moves it faster.

Moves more yardage because the LeTourneau Power Unit gives the operator trigger-quick control of LeTourneau Equipment—no time lost waiting for pressure to build up.

Moves more yardage because LeTourneau Units are built by arc welding of special steels to take the jarring of the toughest jobs—breakdowns and repair costs are practically nil.

Moves more yardage because heavy duty bearings and big pneumatic tires lighten the draft of Carryalls and Buggies, because a correctly curved bowl keeps the dirt rolling in front of Bulldozers and Angledozers—less tractor power is wasted overcoming friction, more power is available for payloads.

Ask for Data Sheet Proof—You don't have to "guesstimate" when considering LeTourneau Equipment. Our Engineers are constantly gathering detailed, on-the-job facts and figures. If you will write us describing your problems, our Engineers will gladly supply you with data sheets telling how other contractors have whipped similar problems.

R. G. LE TOURNEAU, Inc.
PEORIA, ILLINOIS STOCKTON, CALIFORNIA

Manufacturers of: Angledozers, Bulldozers, Buggies, Carryall Scrapers, Derricks, Rippers, Sheep's Foot Rollers, Power Control Units.

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Air operated vibrators for all classes of concrete construction including Bridge deck slabs, Dams and Locks, Highway pavement and Concrete products.

Write for circulars and engineering data.

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VIBRATORS**

997 West Side Ave. Jersey City, N. J.

How the Other Fellow Did It

Ideas Which Have Already Proved Helpful to Contractors

Holder for Marginal Bars in Concrete Pavement Slabs

362 Guy B. Maxey of S. O. Maxey & Co., of Durant, Okla., paving contractor, believes that each job offers a fresh opportunity to try out a new device for making the work easier and more accurate. On his 3-mile NRH contract at Walters, Okla., this past spring he put into use a clever device for holding the pairs of marginal bars at the proper positions.

The holder was of welded sheet metal 6 inches wide, the distance of the bars from the forms, and 10 inches high, the depth of the forms. It was about 3 inches thick and had a lifting handle on top and two projecting rods for holding the bars at the correct elevation. When thrust into place on the grade the handle was naturally pushed down and the two rods forced out by a cam arrangement inside. When the concrete had been placed around the device supporting the bars a pull up on the handle first released the two rods holding the bars and then lifted the device clear of the concrete.

The supporting rods had to fit the holes rather closely so that grout would not leak in and clog the springs which pulled the rods back when the cams were released by lifting on the handle.

Welding Generator "Sleuths" for Plugged Conduit

363 In pouring concrete in a large power-house recently, some conduits became plugged with cement. Since no one knew exactly where the pipes ran in the floors and walls, the problem was to locate them without digging up unnecessary parts of the flooring. By connecting the electrodes from the Westinghouse welding set to the ends of the pipes and using an ordinary compass, it was possible to draw a chalk line over the pipe in trouble. Then a fish tape was used to measure the distance from the ends to the plugged portion, making it possible to break out the concrete directly at the point of obstruction.

In spite of the fact that the pipes were 14 inches below the surface half an inch or less deviation from the direct line could be detected with the compass needle. W.E.M.C.:35

Handy Measuring Device for Water for Concrete

364 Because of difficulty with a water-measuring device and the need of constantly resetting it for the different amounts of water needed according to the per cent of moisture in the aggregates, the C. G. Kershaw Con-

tracting Co. of Birmingham, Ala., rigged up a device for its concrete mixing plant.

An ordinary house hot-water boiler was set up vertically on top of the mixer, with a pair of water gage glasses to show the height of the water in the boiler. The boiler was calibrated and was found to hold one gallon for each 2 1/8 inches of height. Wood strips were marked with the amount of water and securely wired to the gages. Then a pipe was set in near the bottom of the boiler and left free to swing and with the upper end open. By setting this open end at the elevation of the water desired in the tank it was possible to prevent any excess water being used in the mix. The pipe was held in place by a heavy wire but could be adjusted in a moment. 469:34.

New Trucks for Virgin Isles

Six 1935 Ford V-8 trucks, equipped with 1 1/2-yard Galion bodies, have recently been purchased by the U. S. Department of the Interior for delivery to the Virgin Islands where they will be used in general road and forest improvement work.

The bodies measure 84 inches long, 66 inches wide, and 12 3/8 inches high and are fitted with hydraulic hoists. The double-acting end-gates are controlled by a lever placed near the driver's seat.

Shear Plate for Dowel Increases Effectiveness

The standard round dowels used to connect adjacent slabs through an expansion joint tend to crush the concrete and bend the dowel if there is relative vertical movement between the two slabs. The Heltzel Steel Form & Iron Co., Warren, Ohio, has developed

shear plates from 1/4 to 1/2 inch thick, 4 to 12 inches wide and 3 inches high, which are well anchored 4 to 6 inches into the body of the slab to prevent damage to the concrete. Through a slot in the shear plate, a flat dowel bar 1/2 inch thick by 2 inches high and of suitable length, but usually shorter than the present standard dowel bar, fits snugly into the slot in the shear plate. This entire dowel plate is coated with paint or tar to permit movement within the slab.

Tests have shown an increase of load transfer more than three times as great as with present dowels without shattering the slab. These new Heltzel dowel bars were sheared through in destructive tests without crushing the concrete.

This improved method of doweeling is claimed not to increase the cost; it uses the same number of dowels but with greater cross section and reduced lengths. The shear plates and dowels are applicable to either premoulded or poured joints or the new air-cushioned metal joints.



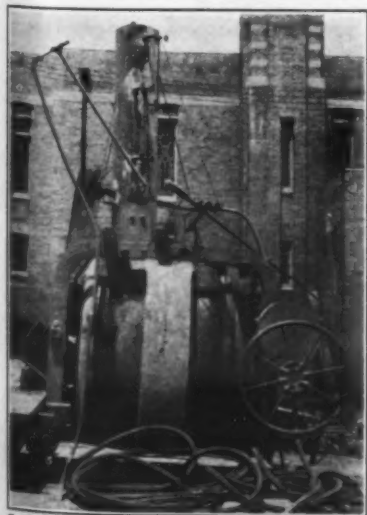
State Highway, York Beach, Maine. Tarvia-built in 1913—before the World War—this easy-riding, skid-safe highway is just as satisfactory for 1935 traffic as it was for the automobiles of 22 years ago.



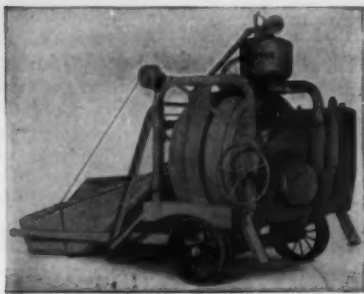
Barrett
Tarvia
GOOD ROADS
AT LOW COST

For 31 years, The Barrett Company has pioneered in the low-cost road field, developing and improving materials and methods to assure the most miles of smooth, easy-riding, skid-safe road from every dollar spent. With Tarvia, you can build roads to meet immediate needs, and easily and quickly widen or strengthen them as traffic increases. There is a minimum of inconvenience to motorists and property owners, and costs are impressively low. The Tarvia field man will gladly give you the details. Phone, wire or write our nearest office.

THE BARRETT COMPANY New York Chicago Birmingham Philadelphia St. Louis Minneapolis
Hartford Detroit Cleveland Boston Buffalo Columbus Milwaukee Providence Syracuse Lebanon Toledo Cincinnati Baltimore
Youngstown Bethlehem Rochester Portland, Me. In Canada: THE BARRETT COMPANY, LTD., Montreal, Toronto, Winnipeg, Vancouver



C. & E. H. Photo
House Hot-Water Tank Mounted Over Mixer for Measuring Batch Water



The New 14-S Dandie Trail-Mix

New 14-S Trailer-Mixer Narrow, Light in Weight

A new 14-S mixer of sufficient light weight for towing on two wheels, offering the contractor flexibility of equipment and permitting quick spotting for all types of concrete construction, has recently been announced by the Koehring Co., 3026 West Concordia Ave., Milwaukee, Wis., as the latest addition to the line of Koehring Dandie mixers which have been developed during the past year.

This new 14-S Dandie Trail-Mix weighs only 5,100 pounds, is 90 inches wide and has a capacity of 14 cubic feet of mixed concrete plus 10 per cent. Power is furnished by a LeRoi 4-cylinder 14-hp gasoline engine or a 10-hp electric motor. The charging skip is welded and water-tight, 66 inches wide, and 16 inches high at the closed end, with a discharge angle of 50 degrees reached in 8 seconds. A brake automatically stops and holds the skip. It is so placed that no obstruction at the front or side interferes with loading and wheelbarrows may be dumped directly into the skip.

Another feature is the Koehring automatic skip-flow shaker which causes a shaking action along the natural flow-line of the material. The shaker arm raises the complete skip structure within the slotted pivot bearings. The mixing drum is of high carbon steel, electrically-welded and water tight. The height of discharge is 32 inches from the ground and is self-locking in both discharge and non-discharge positions.

A new catalog recently issued by Koehring Co., describing in detail the features and specifications of this Trail-Mix, may be secured without obligation direct from the company.

Republic Steel Moves Philadelphia Office

The Philadelphia District Sales Office of the Republic Steel Corp., and subsidiaries, Berger Mfg. Co. and Union Drawn Steel Co., moved on May 18 from the Fidelity-Philadelphia Trust Building to the Broad Street Station Building, 1617 Pennsylvania Blvd.

J. B. DeWolf continues in charge of the office as District Sales Manager, assisted by the present staff.

THE NATIONAL CARBIDE V-G LIGHT

Gives you daylight conditions on night jobs. Spreads a full, even beam of 8000 candlepower right where you need it.

Lights up the job for twelve hours on one 7-pound charge of National 14-ND Carbide and 7 gallons of water. Is easily handled by one man; has nothing to get out of order; no harm done if it tips over—just stand it up again, and it goes right on working. Weight 35 lbs. empty; 98 lbs. when full.

Write for catalog on V-G Lights, V-G Handy Light and Lantern.

NATIONAL CARBIDE SALES CORP.
LINCOLN BLDG., NEW YORK
(Opp. Grand Central)

Calcium Chloride in Mix Proved Effective in Test

Tests conducted by the Highway Department of the District of Columbia show that complete dissolution of the calcium chloride will take place within the mixing time and that entirely satisfactory results will be obtained by placing the dry flake calcium chloride directly in with the materials in the skip, as well as if the solution of calcium chloride were added to the mixing water or directly into the drum of the mixer.

This method is of particular importance for use on small projects where it is not practicable to require equipment designed to control mechanically the incorporation of the specified amount of calcium chloride.

In the laboratory tests conducted to determine the completeness of solution, the mixing water containing calcium chloride was filtered from the concrete after the completion of one minute of mixing in a 2½-cubic foot mixer. In

all instances, the calcium chloride concentration of the filtered solution was determined, and the results definitely revealed that complete solution of the dry flake calcium chloride had resulted.

Test on numerous control beams, made under comparative field conditions, in which calcium chloride was introduced into the mix in the dry flake as well as in solution form, showed that both methods of introducing calcium chloride provided equally high strengths.

MacIntyre of Link-Belt Moved to Dallas

Announcement has been made by the Link-Belt Co., of Chicago, Ill., that R. Y. MacIntyre who has served as its representative in Memphis, Tenn., since 1932, has been transferred to the company's district sales office and warehouse in Dallas, Tex., where he will assist E. G. Wendell, the local manager.

WHY?



FLEXIBLE ROAD JOINT MACHINE COMPANY

Why are good roads indorsed by the public? The reasons: Necessity—Efficiency—Honesty.

Last year over 30,000 lives were lost—partly because road building has not kept pace with requirements. FLEX-PLANE contraction joints control cracking and make roads safe. FLEX-PLANE screeding machines are unsurpassed for eliminating bumps.

WARREN, OHIO

Dual performance

... NOW

**available in GMC 1½-2 ton
TRUCK OF VALUE!**

**Saves gas and oil, lessens wear
and tear and assures more power,
pick-up and speed.**

Now users of trucks in the 1½-2 ton range can get DUAL PERFORMANCE—that revolutionary truck improvement that seasoned operators everywhere have been quick to recognize as one of the few major truck refinements of the past ten years.

Already in the 2-3 ton range, the GMC Dual Performance axle has proved its ability to effect big savings in gas and oil as well as lower maintenance costs inasmuch as there is far less wear and tear on engine and other driving units. Power, too, is more

effectively utilized—the truck will climb a steeper grade, travel at faster speeds and handle bigger loads easier. All in all, Dual Performance saves money, saves time, enables the truck to do more work.

Weigh well the importance of this great GMC truck feature. Weigh, too, the importance of every one of the additional 47 cost-reducing features of the GMC 1½-2 ton truck of value, the truck that out-scores each of its chief competitors on many counts—out-scores with such important features as greater payload capacity, higher sustained torque and Lockheed hydraulic brakes with centrifuse drums and unusually large, quality brake linings.

General Motors Trucks & Trailers 1½-22 TONS

GENERAL MOTORS TRUCK CO.

Time Payments Available Through Our Own Y. M. A. C.

PONTIAC, MICHIGAN

Composite Pile Trestle Structure

(Continued from page 17)

length available. The shells of oysters for which this area is noted were one of the chief causes of hard driving. They ran in drifts diagonally across the line of the bridge and often one pile of a bent would drive as though in soft mud right up to the last few feet and then take up quickly while the very next pile would take up almost as soon as driving started, only to break through the hard stratum and drive easily up to the last few feet. Only a comparatively few piles were lost by breaking and those were mostly in the treated piles where the creosote oil had slightly weakened or accentuated an existing weakness in the timber.

A few piles which failed to give the required bearing at the end of driving were allowed to rest for a short time and then tested again and almost invariably the bearing had increased greatly. One pile, driven during my visit to this work, gave a bearing of only 13 tons when driving was stopped because the pile had been driven to the limit of its length. When allowed to set up for 55 minutes, it gave a bearing of 24 tons.

As soon as a bent was driven the piles were tied together by sapling ties cut and marked for the proper spacing of the piles and nailed with two spikes for each pile. This prevented any swaying of the piles in wind or tide which might cause them to get out of line before the capping crew reached them. The pile bents were straightened by cables from the tops of one bent to the water elevation of the next with steamboat ratchets in the line for pulling.

The capping crew worked from a barge which carried the material. The caps were placed as soon after the driving as possible but was not sufficiently fast to keep up with the rate of driving, making it necessary to put on a second capping crew particularly when the overhead pile driver was placed in service. The barge of the capping crew carried a Domestic portable air compressor and a General Excavator gas crane. The barge itself measured 30 x 50 x 5-foot depth. The draft was 20 inches with the working load.

The sway bracing for the bents was 3 x 10-inch creosoted timber bolted with 3/4-inch galvanized iron bolts wherever it crossed the piles. The 12 x 14-inch x 24-foot long caps were also treated and were bolted to No. 2 and 4 piles with galvanized iron stirrups and with a 3/4 x 21-inch drift pin into each pile.

The Overhead Pile Driver

The overhead pile driver was necessary on two sides of the swing span where there was not sufficient water for the floating equipment. The floater was put in to drive three bents and then the overhead mounted on them and carried on from that point. On the west approach the locomotive crane from the yard was run out to start the bents before the overhead driver was set up on them. A 3,000-pound Vulcan drop hammer was used on the overhead operated by a 30-hp Novo two-drum gas hoist.

Quantities

The quantities of material for the pile trestle were 98,000 feet of untreated piling, 118,000 feet of treated piling and 301,000 feet BM of treated timber for caps, sway-bracing, etc. The structural steel for the I beams and fittings amounted to 4,280,000 pounds.

Personnel

The contractor for the pile trestles was Doullut & Ewin of New Orleans, La., for whom T. C. Bruns was Job Manager and Engineer and H. G. Byrd,

Superintendent. E. S. Fraser was Project Engineer for the State Road Department of Florida and W. S. Gudgell was Resident Engineer-Inspector for the Public Works Administration, Project 843.

Work on Illinois Bridge Progressing Rapidly In Spite of High Water

Work on the new \$100,000 bridge across Rock River near Prophetstown, Ill., is progressing rapidly, since the river has lowered to normal stage. The south abutment in Prophetstown township and two of the four piers have been completed and work has been started on the north abutment in Lyndon township.

The Clinton Engineering Co., which has the contract to build the abutments, piers and cement floor of the bridge, started work last November but was delayed several times by high water. In-

dications are now that the bridge will be completed August 1, according to a special story in the Davenport, Iowa, *Daily Times*.

When completed the bridge, which is being constructed by the State of Illinois, will be approximately 480 feet long, with a 24-foot roadway. The Clinton Bridge & Iron Works has the contract for the steel work, which will be started shortly.

The old bridge, erected in 1893, has been in bad repair for the past six or eight years, and the heavy traffic necessitated a stronger span. Following the opening of the new structure, the old bridge will be junked.

Sullivan Moves Offices

Sullivan Machinery Co. of Chicago, Ill., has announced that its general offices have been moved from the Wrigley Building at 400 North Michigan Avenue to the Bell Building, 307 North Michigan Avenue.



LANSING 3-T MIXER

FOR FAST TRAILING FAST MIXING

Large mixing drum. Hyatt roller bearing wheels. Wide-tread rubber wheels and spring shock-absorbers. Alemite fittings. Leeson 2 h.p. gasoline engine. WRITE—for specifications and current prices.

LANSING COMPANY

LANSING, MICHIGAN

CHICAGO NEW YORK PHILADELPHIA
BOSTON KANSAS CITY MINNEAPOLIS
SAN FRANCISCO

CLETRACS MOVE 15% MORE DIRT

GASOLINE
AND DIESEL
POWERED
TRACTORS
FROM 22 TO
80 HORSE-
POWER

A WEST COAST CONTRACTOR*, operating a fleet of crawler tractors, of which five are Cletrac "Eighties," says, "In 18,000 hours of operation my Cletracs and self-loading equipment have consistently moved 15% more dirt than any of my other equipment in the same power class." Owners everywhere are operating Cletracs with similar results. Let your Cletrac dealer show you why Cletracs are breaking performance records.

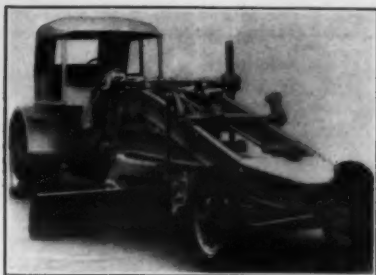
THE CLEVELAND TRACTOR CO., Cleveland, O.

*Name on request



Cletracs
operating
12 yard
self-loading
equipment

CLETRAC CRAWLER TRACTORS



The New Warco Road Hog

Rear-Controlled Grader Has Modernized Design

Termed "the Grader of Tomorrow," by the manufacturer, the new Model 35 Road Hog grader recently announced by the W. A. Riddell Co., Bucyrus, Ohio is entirely new in design and construction. It is made in two sizes, so constructed that all standard types of tractors may be used.

Frames for 40 to 50-hp tractors are 10 inches high, weighing 30 pounds per foot, while for lighter power a 10-inch frame weighing 25½ pounds per foot is used. The frame is a welded rigid frame with five cross braces of tubular and box section construction, all connections being hardened ball joints with machined adjustable bearings.

One of the features is the two-speed variable control power lift, giving fast movement to the blade, cross shaft, circle turning and scarifier at a normal rpm of the motor or at low throttle. This new power control assembly is grease tight, with drop forged, machined and hardened gears and clutches, operating on ground, splined shafts with replaceable bronze bushings and patented oil seals. Another feature is the pivoted spring suspended front end whereby any tension may be put upon the spring, eliminating chatter and side whip in high-speed maintenance work.

The size of the circle has been increased over that of previous Road Hog models to 61½ inches, with adjustable take-up to eliminate chatter. Moldboard connections to beams are ball and socket construction.

Missouri Distributor Moves

Tulley Equipment Co. recently moved its quarters to Webster Groves, Mo., on U. S. Route 66. Its address is R. F. D. Route 6, Box 124, Webster Groves, Mo.

AMERICAN



GOPHER SHOVEL



The 1 Yard Model 400 "ON THE JOB"

BACK in 1905, we built the American Ditcher Shovel, the first shovel type machine made. Today, American Gopher Shovels are a complete line of successful shovels, built in sizes ½ yd., ¾ yd., 1 yd., 1½ yd., 1¾ yd. and 2 yd. dragline.

Send for new photo publication, "American Gopher Shovels" illustrated, showing action pictures "on the job".



AMERICAN HOIST & DERRICK COMPANY
ST. PAUL, MINNESOTA

Test Piles Proved Value on Louisiana Bridge

Spending money to save it may seem like a paradox, but it was done to good advantage by the Louisiana Highway Commission on the Bonnet Carré spillway highway bridge, 30 miles north of New Orleans, constructed last year by the Keliher Construction Co., of Dallas, Texas.

A part of the contract was the driving and loading of 48 concrete test piles, for which the Commission paid \$400 each for the casting and driving and an additional \$120 each for the loading of these piles. The information obtained determined not only the length of the permanent piles to be used, but also the number of piles per bent and the length of the spans.

That a total expenditure of approximately \$25,000 for these test piles was justified is proved by the fact that the length of the permanent piles actually driven in the bridge resulted in a saving of more than \$60,000 over the estimated

length shown before the test piles were driven and loaded.

A complete description of the casting and driving of the 75,450 feet of con-

crete piles required for this bridge structure appeared in the April issue of CONTRACTORS AND ENGINEERS MONTHLY on page 2.

PORTABLE ASPHALT PLANTS TOWER TYPE

LARGE CAPACITIES HOT OR COLD MIX

Accurate control of materials to comply with any standard specifications for bituminous mixtures.

Send for Bulletin T-248

HETHERINGTON AND BERNER INC

Indianapolis, Indiana

WHY DIAMOND BUILDS ROLLER BEARING CRUSHERS

The 9x36 DIAMOND Roller Bearing crusher in the inset runs freely with a ¼ horsepower motor.

The two men can barely turn the plain bearing crusher of the same size.

The pictures demonstrate the comparative difference between the power requirements of a plain bearing and a DIAMOND Roller Bearing crusher.

To the power savings must also be added the large saving in maintenance and lubrication cost and increased capacity.

These crushers are an important part of Diamond's complete line of portable quarry and crushing and screening plants.

Write for illustrated folder.

9x36 Roller Bearing Crusher

ESTABLISHED-1880

Diamond Iron Works, Inc.
MINNEAPOLIS, MINN. U. S. A.

Relief Employment Hits Skilled Labor

(Continued from page 20)

Bid Prices Increased

The mean level of prices for earth excavation in Illinois has increased from 17 cents in 1932 to 26 cents in 1934. On one National Recovery job at the January 4, 1935, letting in Illinois, 300,000 cubic yards of earth excavation was awarded at 34 cents, and the job possessed no apparent bad features other than the fact that the selection of labor from an employment agency was mandatory.

There is not a contractor today, regardless of experience, and with unlimited cost data at his disposal, who can intelligently estimate the cost of highway work in a locality with which he is not intimately familiar. Man-hours in 1934 were as elusive as so many fairies.

If we disregard the hours which a so-called skilled laborer works during the period when he is being tried out, found wanting and then discharged, the actual man-hours per 1,000 yards of excavation, per ton of steel erected or per mile of pavement laid, has not been increased. Thus, the use of relief labor has failed as a means of production and the local employment agency should be discarded. If this method of hiring labor is not discarded, what is to become of the trained man?

The contractor has trained his organization and feels a moral obligation to it which he does not want to overlook. If national recovery is to be an accomplished fact, then ability and integrity must be recognized and conscientious effort and skill built upon a foundation of experience must necessarily be rewarded. The contractor wants, yes, demands, permission to assist efficient, trustworthy, dependable highway laborers to establish themselves permanently with a real outlook on the future. Thus established, the laborer is an asset to any community and is better able to provide for his less fortunate associates. This is preferable to inefficiency, delays and the general unsatisfactory conditions which result from the placing of laggards and dregs of the industry in his place.

Compensation Risks Bad

Accidents, insurance and the safety of employees must not be overlooked in considering this question. Comparing the number of accidents per thousand man-hours with 1931 and 1932 figures, it is evident that something is wrong. Accidents are so numerous that, even

with the increase in hourly wage rates, which correspondingly increases the compensation premium, the insurance companies are very reluctant to take on any new compensation risks. This condition exists even after the manual rates have been increased from 15 to 20 per cent. Compensation insurance is being canceled repeatedly over the entire nation due to bad experience records laid squarely at the door of unadapted workmen. The history of thousands of accidents show the definite results of ignorance, carelessness and inability.

The Solution

The whole labor schedule should be revised. The contractor must be freed from the mandatory selection of labor, particularly skilled labor, from employment agencies. Give the trained man his rightful place in the scheme of things. The unadapted have no place in the construction industry, and to exclude the competent is only to continue the confusion and chaos out of which we are so earnestly striving to emerge.

This is the basic principle on which the construction industry's portion of the recovery program must be built. The competent employee, properly coordinated in the organization, is the foundation on which the industry has been developed. He is the backbone of construction and is rightfully entitled to recognition.

From a paper presented before the Highway Contractors' Division, A.R.B.A.

Effect of Calcium Chloride on Cements and Concretes

A report of the Bureau of Standards investigation on the "Effects of Calcium Chloride on Portland Cements and Concretes" was delivered by Paul Rapp before the recent meeting of the Highway Research Board. This report, covering a two-year study under a fellowship of the U. S. Bureau of Standards, shows that calcium chloride used as an admixture accelerates the early strength, which

is of great importance in out-of-season concreting. Increase in the one-year strength and greater workability of the mortar, permitting a reduction of mixing water with resulting increase in density and strength, are also reported.

Reprints of this report are available gratis to contractors and engineers by writing to the Calcium Chloride Association, Penobscot Bldg., Detroit, Mich., and mentioning this magazine.

Oshkosh
Folding Barricade

Has adjustable jaw which takes any thickness of cross rail from 1" to 3"—no shim—convenient extension swivel—handy flag socket—strong, light and compact—folds flat—competitively priced. Write for Information

LEACH COMPANY
412 S. Main St. Oshkosh, Wis.

Reduce Road-Building Costs with I-R Auto-Feed Wagon Drills

- ✓ They provide a fast method of handling the most powerful I-R drills with less effort on the part of the operator.
- ✓ The Auto-Feed holds the drill down to its work at all times and gives better control in fitchery ground.
- ✓ The Auto-Feed is entirely automatic. It requires no air or other power and operates equally well in any position.
- ✓ The Auto-Feed is sturdy, compact and free of external moving parts. It permits safe, automatic operation and is of proven, durable construction.



- ✓ Auto-Feed Drills throughout the country are establishing new low records of upkeep costs.
- ✓ Wagon mountings reduce set-up time. Time spent in changing steel can be cut in half or less.
- ✓ Convenient adjustments of the flexible mounting provides for holes in any place, at any angle. Twenty-foot steels are readily handled.
- ✓ Ingersoll-Rand, the oldest of rock drill makers, has a complete line of economical drilling equipment for road-building jobs.

Branches or Distributors in Principal Cities the World Over.

Ingersoll-Rand
11 BROADWAY, NEW YORK, N.Y.

MORE YARDAGE per day



because of power and less cable overhaul.

Give the Williams "Champion" the job of hauling your profit—hook 'er to your crane now.

The Williams "Champion"

Williams digging demons also include Multiple-Rope and Dragline Buckets. Write for bulletin.

THE WELLMAN ENGINEERING CO.
7012 Central Ave., Cleveland, Ohio

WILLIAMS
BUCKETS

Dredge Manatee Delivers the Goods

(Continued from page 18)

Westinghouse motor supplies water under pressure to the main pump stuffing boxes and to the cutter head bearings to keep sand washed out. This pump delivers water up to 100 pounds pressure and is used as a fire pump if needed.

A 4-inch single-stage Morris centrifugal pump driven by a 15-hp Westinghouse motor supplies the cooling water for both the engines. A 2-inch Viking gear pump is used to handle the lubricating and cooling oil to the main 1,000-hp engine and a Hydroil centrifuge is used to clean the oil of both engines. An Ingersoll-Rand 2-stage air compressor driven by a Westinghouse 20-hp motor furnishes air to start the engines in case the starting air is lost from the tanks usually supplied by the compressors mounted on the engines. An air lift siphon is used to pump the bilge.

The four large fuel compartments of 8,000 gallons each, located near each corner, can be used to trim the hull "to a whisker." A 2-inch Roper gear pump connected with a unique manifold is used as a transfer pump and can handle fuel oil in or out of any of the fuel compartments, overboard or inboard.

Lights for Night Work

Two Crouse-Hinds 500-watt floodlights are mounted forward and two more aft to illuminate the area being dredged and the spuds and the pontoon line.

The lighting system is operated at 220 volts. This, together with the slight vibration on the dredge due to the operation of the two diesel engines, at first caused a considerable amount of trouble from broken filaments in the electric light lamps. This difficulty was overcome by using "rough service" lamps for the house and deck lighting, and by connecting two pairs of floodlights in series so that 110-volt lamps could be used in these larger sizes. As the "rough service" lamps are available only in 50-watt size, two of these are used with a double socket wherever more light is required in the engine room than is furnished by a 50-watt lamp.

The Crew

The operating crew for the dredge was as follows for each shift on the highway fill contract between Chef Monteur and Rigolets Bridges: one operator, one tug boat captain, one deck mate who moved the anchors and cared for the pontoon line, two able-bodied deck hands, one shift engineer and one oiler.

Restoring Worn Parts With Welding Electrode

The restoration of worn teeth, lips and bottoms of power shovels, lugs and treads of tractors, housings and impellers of pumps, rock crushing equipment and gear and pinion teeth is possible with a new hard surfacing electrode recently announced by the Lincoln Electric Co., Cleveland, Ohio.

This Abrasoweld electrode provides a deposit of abrasion-resisting alloy of the self-hardening type which surface-hardens very rapidly under conditions of impact and abrasion. Unlike other electrodes, the Abrasoweld deposit develops its maximum hardness only at the surface where it is cold worked, leaving a strong tough core for resisting shock. Weld metal thus produced must be ground to shape as it can not be filed or machined. This new electrode is made in $\frac{1}{8}$ -inch size, 14 inches in length and is used with reversed polarity with a current range of 125-200 amperes and 24-27 arc volts.



The New Adnun Black-Top Paver

Black-Top Paver Features Cutter Bar, Power Cut-Off

A new and improved black-top paver, which will handle any mix, hot or cold, and lays any width or thickness, has recently been announced by the Foote Co., of Nunda, N. Y.

The features of this new Adnun paver are a two-speed cutter bar and a power cut-off. With the cutter bar, which consists of a moving blade much like that of a mower, the speed may be adjusted to give the best results in accordance with the density of the mix. The teeth are beveled on the under side, to give a crowding action against the material and exerting an initial compression that compacts the material in holes. Two operating speeds make it possible to meet the varying conditions of mix.

The power cut-off is a positive closing door that shuts off the flow of the mix to the subgrade, giving the operator absolute control of the laying of the pavement at any time from the control platform. With this power cut-off, the operator can continue operation up to intersections involving a change in grade, shut off the mix while crossing the intersection and then continue on the other side.

Controls are grouped for easy handling where the operator can follow the edge of the course. A new roller lubrication device is provided to prevent material from adhering to the rollers and scrapers also keep the rollers clean. Power is applied to both front wheels and rear rollers and there are three speeds, forward and reverse.

Copies of a new catalog describing this 1935 model Adnun black-top paver may be secured free direct from the Foote Co.

Tests on Concrete and Concrete Aggregates

A report on the significance of tests of concrete and concrete aggregates, sponsored by the A.S.T.M. Committee C-9 on Concrete and Concrete Aggregates, has recently been issued by the American Society for Testing Materials. This publication was prepared to present a clear statement of the significance of the various tests applied to these materials.

Ten sections are devoted to concrete tests and six to aggregates. The former include: compressive strength, tensile and flexural strengths, shearing and torsional strengths, elastic properties, durability, abrasion, workability, volume

changes, cement content, and uniformity. Under aggregates the following are evaluated: gradation, specific gravity, unit weight and voids, soundness, abrasion, free moisture and absorption, deleterious substances, and mortar strength tests. A section discusses the numbers

of specimens or tests required for reasonable accuracy of the average.

Copies of this 123-page report, in heavy paper cover, may be obtained at \$1.25 a copy from the American Society for Testing Materials, 260 So. Broad St., Philadelphia, Pa.

"IT PAYS TO BE DIESEL-WISE"



Three of the CUMMINS Diesel-powered trucks with 16-yard dump bodies, operated since 1923 by Cilco Terminal Co., Bridgeport, Conn. Reports operating costs 50% below gasoline-powered units. "In the matter of power, they were the only truck that could wade through the snowdrifts."

CUMMINS DIESEL ENGINES

for

Trucks — Shovels — Crushers — Compressors — Pumps — Drills, etc.

CUMMINS engineering advancements give you Diesel power at its best! Amazing fuel economy — highest power efficiency — enduring dependability. Easily installed to replace gasoline engines. **PROVED PERFORMANCE** — in heavy-duty truck service alone, CUMMINS Diesels are running over 3,000,000 miles a month. Ask for complete facts.

CUMMINS ENGINE CO.,

COLUMBUS, IND.

—The Leader in Diesel Engineering Advancement

SALES AND SERVICE FROM COAST TO COAST

SAUERMAN LONG RANGE MACHINES



for Digging in the Dry or Under Water

Reach as far as 1500 ft.

Dig Deep; Dump High.

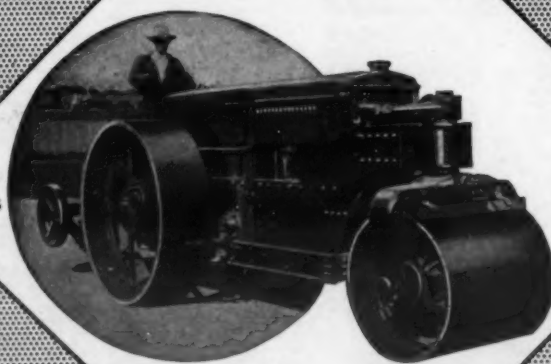
Capacities from 100 to 5,000 cu. yd. a day.

Low in Cost

Write for Catalog.

SAUERMAN BROS., Inc.
464 S. Clinton St.
CHICAGO . . .

THE MOST POPULAR ROLLER IN THE UNITED STATES IS THE BUFFALO-SPRINGFIELD



THE BUFFALO-SPRINGFIELD ROLLER CO. Springfield, Ohio

THE REASON IS NOT HARD TO FIND (IF YOU HAVE ANY DIFFICULTY, WRITE FOR OUR BOOKLET AND ALL WILL BE "CLEAR AS CRYSTAL")

Lubrication Queries

Is some lubrication problem bothering you? Tell us about it and we shall be glad to help you.

Question

What is the proper way of lubricating vibrating screens which operate at a high speed?—Wausau, Wis.

Answer

Due to the severe duty on the bearings of high-speed vibrating screens, there is always some tendency to run warm even when the bearings are properly lubricated. This heating necessitates the use of a grease which will not separate because of the heat nor because of the churning of the lubricant by the rollers. With each screen sent out by manufacturers of this type of equipment, they include an instruction sheet warning against the use of improper grease. One that we have seen lists a number of widely known quality brands of grease which have been found to work satisfactorily. This manufacturer has told us that in spite of the printed instructions which he furnishes, a great many oil and grease salesmen insist on selling the customer a grease from which the oil separates and runs out as soon as the grease becomes warm. In a short time the bearing becomes filled with the grease filler, sometimes to such an extent that the bearing seizes.

There we have a dual problem. How can we control the lubricant salesman who may be working merely for commission and hence is very desirous of selling some lubricant. We can only repeat the warning we have given so many times capped with a slightly different outlook. Buy your lubricants from a recognized refiner or distributor with a reputation for quality. Such an organization will employ as salesmen only those individuals who have a background and training in lubrication engineering. They will not merely try to sell you "some grease" but rather will advise you intelligently on the proper lubricant to use.

Link-Belt Moves Warehouse in Portland, Ore.

In order to serve the growing needs of local industries, the Link-Belt Co., of Chicago, Ill., has recently moved its Portland, Ore., warehouse from the congested business district on Front Avenue, where it has been located for about twenty years, to the corner of 14th Avenue & Savier Street. The new warehouse, with 10,000 square feet of floor space, is close to the freight sheds, the docks on the water front, and the main highway along the Willamette River and provides facilities for carrying a very complete line of conveying and power transmitting machinery, and for making shipments by rail or trucks.

The company's sales office will also be located at the new address, 1637 N. W. 14th Avenue. D. L. Shirley is Resident Manager.

COMPLETE CUTTING AND WELDING APPARATUS

for all types of light and heavy work. Torches, tips, regulators, hose, goggles, gloves, lighters and wrenches. Low prices—highest quality materials and workmanship.

Write for catalog

The Alexander Milburn Co.

1409 W. Baltimore St. Baltimore, Md.

24-Hour-Old Concrete Piers Withstand Force of Ice Jams

The early strength of calcium chloride integrally-cured concrete was demonstrated last winter at Lock Haven, Pa., dam when 24-hour-old concrete piers effectively withstood the enormous force of ice jams carried by flood waters.

The concrete for the dam was poured the previous day at a temperature of 38 degrees F. and the forms were removed the following morning. In the afternoon the river started to rise and by 8 o'clock in the evening the cofferdam had been washed away.

The new dam, which is of the Amberson gravity type, was subjected to the impact from a 16-inch thickness of ice which snapped off 12-inch power line poles and bent extruding reinforcing bars in its course of destruction.

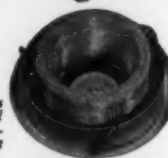
Examination of the concrete after the water had subsided showed that no damage whatever to the concrete had resulted.



Oil Bath Type

Truck users include

MACK
WHITE
STEWART
AUTO CAR
F. W. D.
WALTER
BROCKWAY
KENWORTH
CORBITT
and on all types of industrial and construction equipment



NON-CLOGGING NON-RESTRICTIVE

AIR-MAZE

AIR FILTERS FOR EVERY INDUSTRIAL PURPOSE

See the Difference!

Look inside the air filter you are using—and then look inside an Air-Maze. What a difference! For the Air-Maze does not build up, clog or have restricted areas, to cause uneven air flow and loss of power. A clogged filter can reduce gas-line mileage as much as 20%. But the patented and exclusive Air-Maze construction assures an exact, uniform density at all times.

SPECIFY AIR-MAZE when ordering new equipment and get those important "plus" features that are only to be had with the genuine Air-Maze.

AIR-MAZE CORPORATION • 812 HURON ROAD, CLEVELAND, OHIO



The best proof of their quality
is the money they save you in
HAULAGE COSTS

CHEVROLET Put Chevrolet six-cylinder trucks on the job and you can be sure you will get low operating costs! Chevrolet quality manufacture stands squarely behind this statement of fact. Examine a Chevrolet truck—from husky rear axle to efficient cooling system—and you will find quality materials and precision construction in every part.

The result is vital savings for you—fuel savings from the famous Blue-Flame valve-in-head truck engine, and maintenance savings from the rugged chassis. You have every reason to register more payload hours—and more profitable payload hours—when Chevrolet trucks go to work for you!

CHEVROLET MOTOR CO., DETROIT, MICH.

Compare Chevrolet's low delivered prices and easy G. M. A. C. terms. A General Motors Value

WORLD'S LOWEST-PRICED TRUCKS

CHEVROLET TRUCKS

FREE! Mail coupon for "OWNER'S SIMPLIFIED OPERATING RECORD"

Chevrolet Motor Company (Dept. 20A)
Detroit, Michigan

Gentlemen: Without obligation on my part, send me the "Owner's Simplified Operating Record" booklet which enables truck owners to learn operating costs quickly and accurately.

Name and title _____

Company _____

Address _____



**"Now I know why so many
CONTRACTORS
are changing to FORDS"**

"I READ that Ford dealers were inviting responsible truck owners to make their own tests of the 1935 Ford V-8 Trucks and Commercial Cars. I called a Ford dealer and asked for an 'on-the-job' test . . . with my own loads, over my own routes . . . and now I know why so many operators are changing to Fords.

"It didn't take me long to discover that I've been 'spotting' my competitors who use Ford V-8's too many important advantages. In the first place, I've been trying to buck V-8 Performance. In the second place, I've been up against V-8 Economy. And in the

third place, while I've been footing big repair bills, they have been enjoying V-8 Reliability and the advantages of Ford's Low-cost Engine Exchange Plan and other parts exchange privileges.

"That 'on-the-job' test showed me how to save TIME and save MONEY. I'm not spotting ANYBODY ANYTHING any more.

"And if you are competing with V-8 owners too . . . take my advice and quit trying to BUCK them. Change over to Fords . . . like I did . . . and give them, and all the rest of your competitors, a run for their money!"



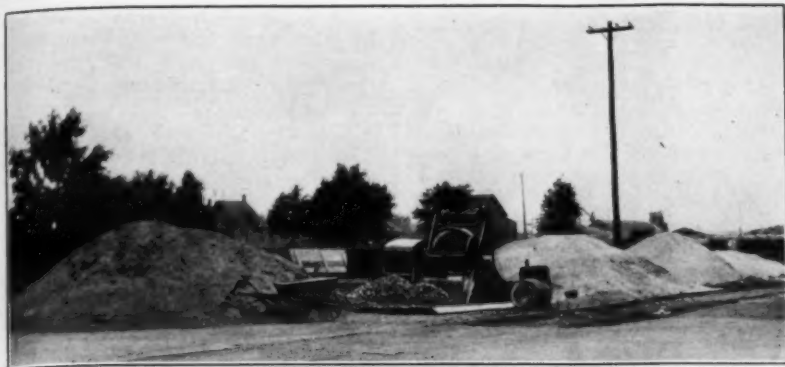
**FORD V-8 TRUCKS AND
COMMERCIAL CARS**

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AMER
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Preparing Patching Material by Mixing Tarvia-KP and Aggregate in a Small Concrete Mixer

Bituminous Patching for Streets and Roads

Patching holes in all kinds of pavements may be done with Tarvia-KP, a product of the Barrett Co., 40 Rector Street, New York City, which is manufactured to meet rigid specifications for a cold-patch material.

Holes to be patched must be cleaned so as to remove all dust, dirt and loose material and the sloping edges of the hole must be cut so that the sides will stand vertically. This preparation is most important, whether cold or hot patching material is to be used.

No hard and fast rules for proportioning the ingredients of the mix can be given, but in general a soft stone, such as limestone, requires more Tarvia than a hard stone like trap rock. Sufficient Tarvia-KP must be used to coat thoroughly all of the aggregate but not sufficient to run off the stone when the mix is placed in piles.

Aggregate should be clean and dry when mixed. Mixing can be done by turning the aggregate and Tarvia with shovels by hand. The aggregate should be placed on a mixing board and the proper amount of Tarvia-KP poured over it in one or two applications. The mixture should be turned two or three times.

Better work can be done by the use of a mechanical mixer. Any ordinary concrete mixer is satisfactory. Aggregate, Tarvia-KP and fine aggregate should be placed in the mixer in the order named, and mixing should continue until all of the aggregate has been coated, usually requiring about two minutes. The mix may be used immediately although it will be somewhat

tougher if permitted to cure in a pile for a few days.

The mix should be placed in the hole using sufficient to slightly more than fill the hole. The patch should be well consolidated by tamping or rolling. If the road being patched is to be surface treated, it is not necessary to seal the patches. Otherwise, all but the most

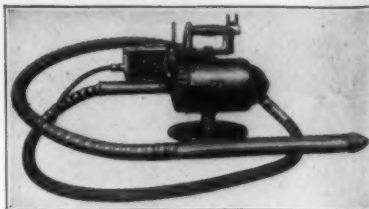
temporary patches should be seal-coated.

Complete instructions for the use of Tarvia-KP, as well as for Tarvia and Tarvia-Lithic for the maintenance of bituminous, brick, concrete, gravel and other pavements, are contained in a new road maintenance book which is available free to interested contractors and engineers by writing direct to the Barrett Co. or to this magazine.

Two New Distributors for Hypressure Jenny

Homestead Valve Manufacturing Co., of Coraopolis, Pa., has announced the appointment of the W. T. Walsh Equipment Co., 3088 West 106th Street, Cleveland, Ohio, and Alban Tractor Co., 725 East 25th Street, Baltimore, Md., as exclusive distributors for its spray cleaning unit Hypressure Jenny.

REDUCE YOUR SPADING COSTS!



MALL TOOL COMPANY

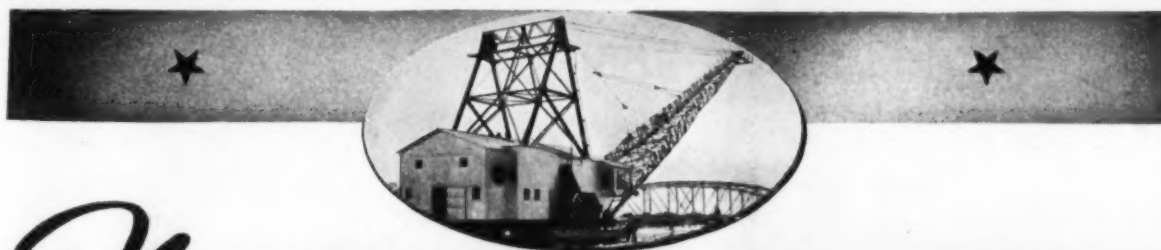
USE MALL CONCRETE VIBRATORS

FOR economical compaction of low slump concrete on every type of concrete structure.

Illustrated: MALL 3 hp. heavy duty electric machine with 2 1/2" vibrator. Furnished with 14 ft., 21 ft., or 28 ft. of flexible shafting. Attachments for grinding and rubbing.

Portable gas engine units for use on jobs where power is not available. Bulletins on request.

7743 South Chicago Avenue
CHICAGO, ILLINOIS



Now YOU CAN LUBRICATE SHOVELS WITH Alemite Powerguns

Stationary Installation Permits Piping of Lubricant Under Pressure Throughout Machine — Provides Convenient Outlets at Necessary Points — Eliminates Constant Refilling of Hand Guns

HERE'S the most amazing and revolutionary power-shovel lubrication development in history—a simple, labor-saving method of cutting lubrication costs to an absolute minimum and for making sure that every bearing gets adequate and positive attention. It eliminates the handling and carrying of lubricant containers and the constant refilling of hand guns and puts tons of pressure at the operator's command—insures a better, more complete job and makes the job easier.

What It Is and Does

Installation of an Alemite Powergun is simplicity itself, thereby making it available for use on shovels now in operation or on new equipment. The gun (either air- or electrically-operated) is mounted in a stationary position in the shovel cab and connected to piping that extends throughout the machine. Shut-off valves are located at convenient points (usually two outside the cab and two inside), and provision made for connecting hose quickly. After connection is made and shut-off valve opened, operator measures and regulates lubricant flow by means of a hand-control valve on the hose.

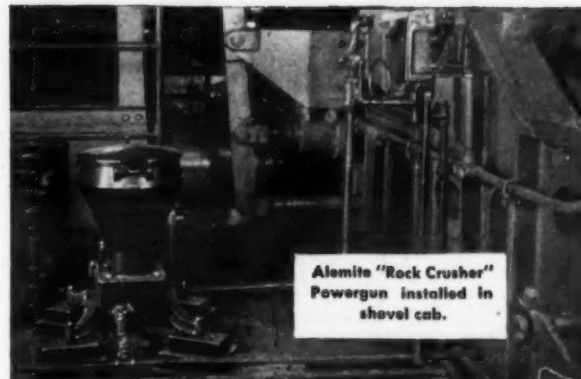
Alemite Powerguns are available in a range of sizes that make them applicable to any job. They will handle grease of all types and will deliver it from original containers or from gun reservoir as the case demands. Get complete information on this money-saving, labor-saving, lubricant-saving equipment today. Send the attached coupon now. There's no obligation.

ALEMITE CORPORATION

(Division of Stewart-Warner Corporation)
1850 Diversey Parkway Chicago, Illinois
Stewart-Warner-Alemite Corp'n of Can., Ltd., Belleville, Ont.

ALEMITE

Controlled Application of the Correct Lubricant



Alemite "Rock Crusher" Powergun installed in shovel cab.



Lubricant piped under pressure to convenient outlets simplifies servicing of all bearings.

ALEMITE CORPORATION (Div. of Stewart-Warner Corp'n.) Dept. F
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Please send me complete information on the lubrication of Power Shovels with Alemite Powerguns.

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AMERICAN GOPHER SHOVEL

The 1 1/2 Yard Model 450
"ON THE JOB"

We invite you to send for our new, interesting Free rotogravure magazine "American Gopher Shovels" Illustrated.

Write to

AMERICAN HOIST & DERRICK COMPANY
SAINT PAUL MINNESOTA

Perini Elected President of N. E. Road Builders

At the annual meeting of the New England Road Builders Association this spring, Louis R. Perini, President of B. Perini & Sons, Inc., one of the largest and most active road paving companies in New England, was elected President of the Association.

Other officers elected were C. Joseph

Maney, Cambridge, Mass., Vice President; Joseph A. Tomasello, of Boston, Treasurer; David A. Bridge, Hazardville, Conn.; Carlo Bianchi, Framingham, Mass.; James A. Knowlton, Belmont, Mass.; Abner P. Lawton, of Providence; E. Raymond Newell, of Uxbridge, Mass.; D. W. Overocker, Burlington, Vt.; James F. Powers, of Brockton, Mass.; Ovid F. Winslow, Nashua, N. H., Directors. Frederick Hoitt was re-appointed Secretary.

New Officers for White Co.

At a recent organization meeting of the directors of the White Motor Co., Cleveland, Ohio, R. F. Black was elected President of the company to succeed A. G. Bean, who was elected Chairman of the Board. Because of his health, Mr. Bean desired to be relieved of active duties as President, though he will remain in charge of the company's affairs.

Until his election, Mr. Black was President of the Brockway Motor Truck Corp. and previously had been Vice President of the Mack-International Motor Truck Corp.

Executives who were re-elected were: T. R. Dahl, Executive Vice President and Secretary; George H. Kelly, Vice President and Treasurer; G. F. Russell, Vice President in charge of sales; H. K. Tork, Vice President, Public Works Division, and S. G. Crilly, Comptroller.

ASPHALT FOR PAVING... ASPHALT FOR P


**"LET'S
MAKE THE MOST
OF THIS MONEY!"**

"An economical road or street paving project is easier to sell because it's a better buy for the community. Properly planned paving jobs make a fine and lasting visible record for public official and contractor alike. Have you considered your year's work from this standpoint, of its recommendation of your ability in the future?"



THERE are two phases of economy in every paving job: first, the immediate cost of materials and labor; and second, the average of this original investment, plus maintenance, over a period of years.

Asphalt wins on both accounts, because the installation investment can be controlled to fit requirements. For heavy traffic, for moderate traffic, for light traffic; the expense of paving with asphalt is adjustable to actual demands. And maintenance costs are low when the job is well done.

The wide range of Stanolind asphalts makes intelligent selection and exact specifications possible. Write or call your nearest Standard Oil (Ind.) office for full information on these materials. 

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SHEET
JACKSON

Stable Clay Fill for Bridge Approach

(Continued from page 15)

verts, its large area permitting ready flow of flood waters. If the relief channel or opening were not provided, the water would top the embankment and in rushing over would wash it out, completely destroying the investment and impeding traffic for a long period. Not knowing exactly the penetration which would be required for the piles for the trestle, the state ordered the contractor to purchase three test piles each 50 feet long which were driven to refusal. After this was completed and the piles loaded, the contractor was told what lengths of piles to order for the trestle. He was paid for the piles only to the cut-off line so that he was not penalized by hazarding a guess as to the proper length of pile to order.

The relief opening has forty 20-foot panels with five creosoted piles per bent carrying a concrete deck on steel I beams. The roadway is 24 feet wide over the relief opening. The pile driver for the work had 50-foot leads and 65-foot gunwales carrying the leads, with the 2,400-pound drop hammer at one end and the Mead-Morrison hoist powered by a Hercules engine at the other. Thus the leads could be cantilevered out over the end of the fill or beyond the last bent the 20 feet required. The outfit was moved by attaching to a deadman or trees ahead and pulling itself forward by the hoist.

Quantities and Unit Prices

| Item | Quantity | Unit Price |
|--|--------------------------|------------|
| Clearing | 12.65 acres | \$40.00 |
| Grubbing | 5.53 acres | 60.00 |
| Drainage excavation | 7,318 cubic yards | .28 |
| Borrow excavation | 77,475 cubic yards | .28 |
| Overhaul | 2,426,000 station yards* | .0025 |
| Class A concrete | 146.92 cubic yards** | 21.00 |
| Class AA concrete | 414.65 cubic yards*** | 21.00 |
| Reinforcing steel | 116,000 pounds | .9475 |
| Timber piling | 8,900 linear feet**** | .28 |
| Creosoted timber | 57,000 feet BM | 70.00 |
| Creosoted struct. timber | 12,000 feet BM | 87.50 |
| *1,000 feet of free haul | | |
| **1:2:4 mix | | |
| ***1:2:3 mix | | |
| ****The test piles driven and loaded were paid for at \$175.00 each. | | |

Total Contract Prices

| | |
|-------------------------------------|-------------|
| Roadway | \$31,158.72 |
| Repair and reconstruction of bridge | 6,388.00 |
| New bridge (relief opening trestle) | 40,059.34 |
| Other miscellaneous items | 87.26 |

Total contract prices, not including extras.....\$77,693.32

Labor, Hours and Pay

The work on this project was pushed 20 hours per day, making it necessary to have two crews per day and four crews per week of unskilled labor, working each their 30 hours per week. It was found better to use the skilled labor 5 hours per day for the full 6 days a week so as to hold it on the job. There was other construction underway in the vicinity and all labor has a tendency to drift.

The minimum pay of the unskilled labor was 30 cents per hour and for the skilled labor 50 cents, with averages of 35 cents and 65 cents respectively. During the month of July there was an average of 108 skilled and un-

skilled men on the job with a weekly payroll of \$1,265.70. This was before the trestle construction was started.

Personnel

This project NRH 217A, State 1905-A-U-1, was awarded to Robinson & Young of Baton Rouge, La., for the sum given above. E. R. "Ned" Morris was Superintendent for the contractor and Theo. T. Chenet was Resident Engineer for the Louisiana Highway Commission.

Crown Important Factor in Stabilized Roads

The methods employed and the machinery required in the construction of stabilized roads are flexible and subject to the approval of the engineer in charge. Mixing may be accomplished either by mixing in place by blades or discs or by a machine-mixed method at the material site or by a portable mixer operated on the project.

Water is necessary to obtain compac-

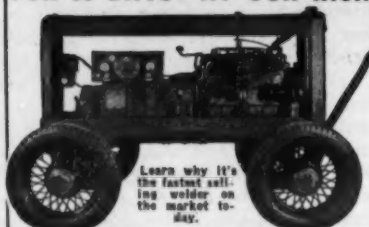
tion of the stabilized mixture. The compaction is more effectively accomplished by truck traffic or a truck-tire roller than by the usual type of roller. Tests of stabilized gravel roads after thorough compaction have been found to weigh 150 pounds per cubic foot.

One of the most important factors in the construction of these roads is that of crown. There is no need for excessive crown, but recent investigation confirms the need of a suitable crown, 0.4 to 0.5 inch a foot, in roads of this type.

A case in point was an experimental stabilization project which had developed shallow pot-holing at intervals along the center of the road. Several reports were made on visual inspections, which attributed the condition to various inherent and external conditions, no one of which could be specifically attested. However, when later examination involving soil analysis, determination of density, and actual survey of crown and drainage conditions, of the affected and unaffected portions was made, it was definitely shown that

the trouble was correlated and attributable to the nature of the crown only, which in the affected areas was less than 0.2 inch a foot.

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The Remote Control feature—at no extra cost, makes it a time saver and money maker on any job.

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HOBART BROS. TROY, OHIO One of the World's Largest Builders of Arc Welders



COMBUSTION CHAMBER

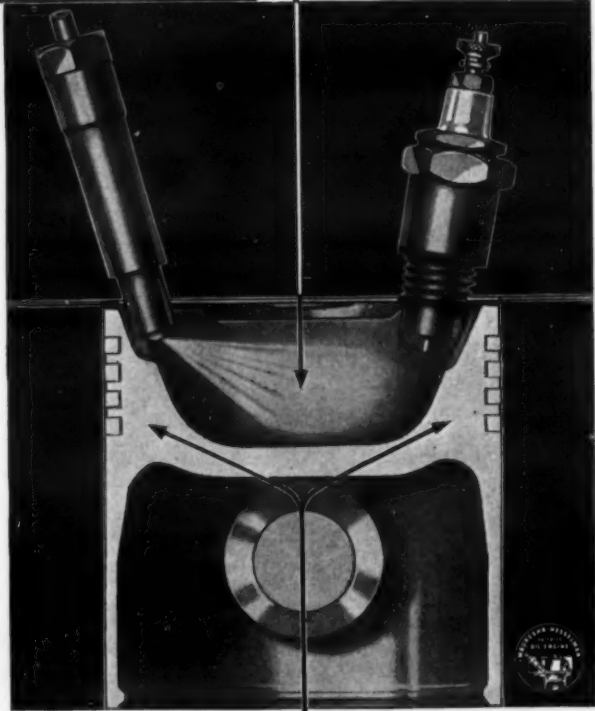
The combustion chamber of the Waukesha-Hesselman Engine is formed by the concave piston head itself. The piston is a single casting. No slots separate the head from the skirt. The extra metal in the piston head, unbroken by ring grooves, conducts the heat from the head to the skirt.

The Hesselman is fitted with wet sleeve cylinders which rapidly transmit the heat of combustion to the cooling water surrounding the cylinders.

Large capacity water jackets are fed by a water pump which builds up a definite pressure to thoroughly scour valve seats and cylinder heads. Ports and passages direct cooling water in definite paths for uniformly efficient operating temperatures. A thermostat, built into the water manifold, controls the jacket temperatures.

A geared pump delivers full pressure oil to all bearings, shafts and gears within the engine, while crankcase mist flood oils the pistons and cylinders. Pressure is maintained under all conditions of oil level by the patented Oil Level Equalizer. The pressure control valve may be set without stopping the engine or disturbing any of the internal parts.

Write today for Bulletin 1000. Waukesha Motor Company, Waukesha, Wisconsin.



METAL TRANSMITS THE HEAT TO PISTON SKIRT BELOW

THIS IS NO. 5 OF A SERIES on the Waukesha-Hesselman Oil Engine. No. 6 will appear next month. A reprint of the complete series will be mailed on request.

HYB-LUM WHEELBARROWS

WILL SAVE YOU MONEY—

Our booklet tells

HOW

and

WHY

SHEET ALUMINUM CORPORATION

JACKSON, MICHIGAN



WAUKESHA ENGINES



Equipment Shop at Bonneville

Careful daily inspection and prompt attention given to defects and wear and tear on heavy equipment is almost a fetish with the Columbia Construction Co., the contractor for the spillway dam of the Bonneville Project. As a result, its equipment is always up to top efficiency. A complete machine shop is maintained on Bradford Island, where they are able not only to make ordinary repairs and adjustments but practically to take down and rebuild any piece of equipment used.

The shop is in charge of W. E. Harper, Superintendent. It is in a substantial building approximately 75 by 150 feet, served with a travelling crane of 10-ton capacity. There have been as high as 100 men employed there at a time, and the average is around 60. The equipment includes steam hammers, drill presses, radial drills, lathes, shapers, hydraulic press, welding equipment, both gas and electric, cutting equipment, and a full complement of all small tools and accessories necessary to rapid and efficient operation.

Among the heavy machines that are cared for and, at intervals, completely over-hauled are one Bucyrus-Monaghan 75-B walking dragline, with 10 and 8-yard bucket; one Bucyrus 75-B electric shovel; one Bucyrus 43-B diesel shovel; one Marion 490; one American-Whirley crane; a fleet of nine LeTourneau buggies, ranging from 16 to 35 yards, with Caterpillar 75-hp tractors; road grader; bulldozers and other smaller equipment. There is also pump work of all kinds, including that on the seven Byron-Jackson deep well pumps of 12,000 gallon capacity, each used in de-watering the cofferdam.

Complete overhauling of motor trucks is done in this shop, although for the ordinary automotive repairs and adjustments a separate automotive shop is maintained.

Hydraulic Trailer-Scrapers

A hydraulic scraper which moves over the highway as a trailer, known as the Wood-Isaacson Karry-Skraper, is made by the Gar Wood Industries, Inc., Road Machinery Div., Detroit, Mich. This scraper can dig hard, compacted or cemented material, shave light soil, or be used as a finishing machine.

When the going is hard, a master jack raises the rear bottom of the bowl clear of the ground, leaving only the cutting edge in contact. Two side jacks then lift the rear end of the vehicle, transferring its weight to the cutting edge. When the material is light or soft, the vehicle rides on its six wide pneumatic tires and the depth of the

cut is regulated precisely and accurately. For finishing, the bowl is set in dumping position with the cutting edge at the desired relation to the surface of the ground.

One of the features of the Karry-Skraper is the use of five double-acting hydraulic jacks. The slope of the bottom of the bowl, the depth of cut, rate of dumping, depth of spread and stroke of clamshell can be regulated at the will of the operator. Two hydraulic jacks control the clamshell; two hydraulic jacks regulate the position of the front end of the bowl and cutting edge; one master jack regulates the position of the rear end of the bowl.

Another feature is the clamshell gate, which takes advantage of the excess material loosened while the going is easy. Its stroke and capacity is based on that volume of material that accumulates ahead of the bowl. It reaches forward into the loosened material and drags it back into the bowl. The clamshell is fastened to the bowl, its relation to the cutting edge and front ends of the bowl remaining constant, regardless of the position in which the bowl is operating. The clamshell in completing its stroke fills the bowl to capacity. It then seats snugly against the cutting edge and vertical ends of the bowl to hold in the full load. The two side jacks then elevate the bowl.

In dumping and spreading, the side jacks lower the front end of the bowl until the cutting edge clears the ground by the depth of spread desired, the clamshell opens and the master jack lifts the rear end of the bowl to the desired dumping angle.

The Karry-Skraper has a 16-foot wheelbase, an overall length of 24 feet 11 inches and an overall width of 10 feet 5½ inches. Its water-level capacity is 10 cubic yards and with a heaped load, 12 cubic yards. Six and 9-cubic yard scrapers are included in this line.

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SPEED! HIGH SPEED
SPEED! MIXERS**



Rex 2 Bagger with end discharge

**MORE YARDS PER DAY WITH REX SHIMMY SKIP
REX FAST, ACCURATE WATER SYSTEM
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Eastern Division: 529 Chrysler Bldg., New York, N. Y. Southern Division: 3704 Lexington Avenue, Dallas, Texas West Coast Division: 303 Harrison St., San Francisco, Calif.

THE MOST COMPLETE LINE BUILT FOR CONCRETE

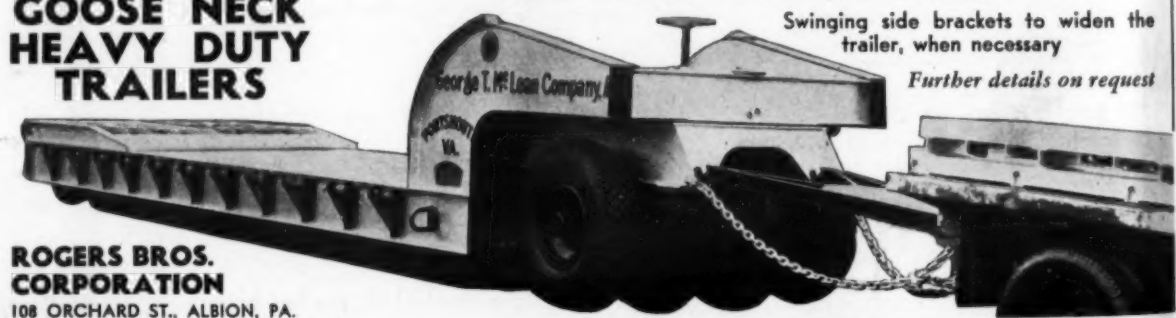
ROGERS GOOSE NECK HEAVY DUTY TRAILERS

**ROGERS BROS.
CORPORATION**
108 ORCHARD ST., ALBION, PA.

8 rear wheels mounted on dual pneumatic tires, with 4 rocking axles
2 rocking axles front, mounted on pneumatic tires

Swinging side brackets to widen the trailer, when necessary

Further details on request



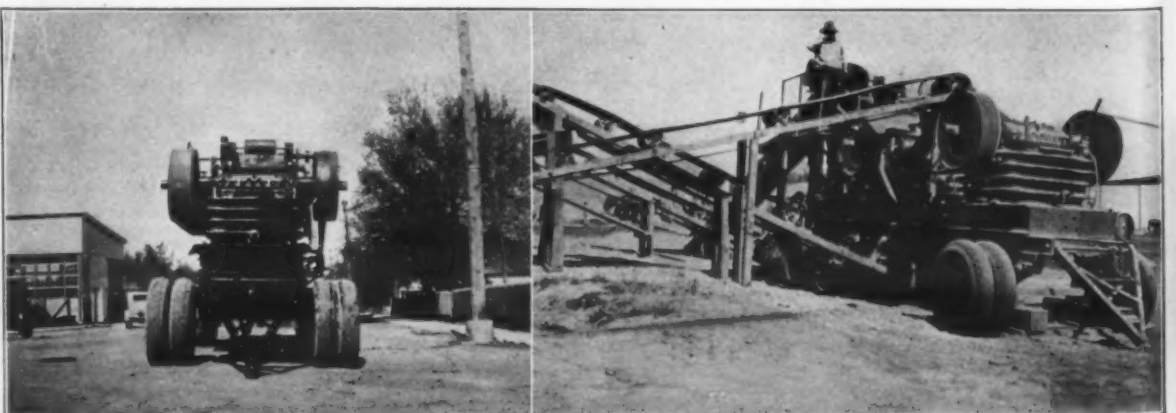
PATENT on MODERN PORTABLE DUPLEX CRUSHING, SCREENING and LOADING PLANT for SALE

Has the greatest output of any Portable Duplex Plant built, and has only about half the working parts of any other Duplex plant; every part accessible; moving, setup and repair costs

extremely low; designed and adapted to any up-to-date crusher. Patent pertains to the design and arrangements of the working parts of plant. Flow sheet may be had on request.

Write for particulars or see plant in operation

HANK KNIPPEL, Inventor—WESTERN CONSTRUCTION CO., Box 652, POCATELLO, IDAHO



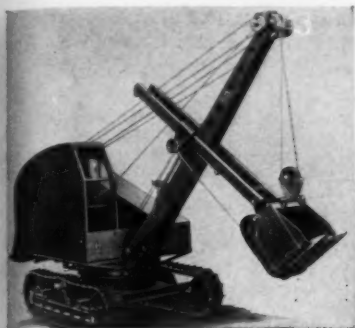
Front view, showing width. Top and bottom in straight line. Left side front view of plant in action, showing reject conveyor coming out from plant and doubling back to reduction crusher.

Change of Address Slip

Contractors and Engineers
Monthly
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The P & H Bantam-Weight 3/8-Yard Shovel

New All-Purpose Shovel Is Light and Fast

A new full-revolving 3/8-yard excavator, known as the Model 100 Bantam-Weight, has recently been announced by the Harnischfeger Corp. Convertibility is one of the features of this new unit, the lightness of attachments making it practical to convert right on the job in a short time.

All-welded fabrication has reduced weight and increased structural strength, according to the manufacturer. The revolving frame and side stands are a single piece, combining automotive box and X frame in one solid welded structure. The boom is also of light welded tube construction.

A Ford V-8 truck motor, delivering 40 hp at 1,300 rpm, furnishes power for this excavator. With the other main machinery units, it is placed behind the center of rotation to reduce dead counterweight. Diesel power is also available.

Complete specifications and operating data on the Bantam-Weight are available in the new Bulletin 100, copies of which may be secured free on request from the Harnischfeger Corp., Milwaukee, Wis.

Protecting Steel Against Corrosion

Unprotected steel exposed to any ordinary atmosphere will rust and corrode. Regardless of what theory of corrosion one accepts, the fact is that in order to prevent corrosion it is necessary to cover the steel with a protective material that will hermetically seal the surface of the steel against the action of everything that causes rust or corrosion to develop. Francis M. Hartley, Jr., M. E., points out in a recent issue of *The Dutch Boy Quarterly*, published by the National Lead Co., New York City.

The commonly used surface protection is paint. A knowledge of the composition of a paint is of primary importance in enabling the buyer to judge for himself in advance whether or not a paint is suitable for the purpose for which it is offered. There are many paints on the market, and many claims are made for them, in some cases quite justified and in others, too optimistic.

The buyer is entitled to know what a paint will do *before* instead of *after* he has used it. If the composition of the paint is unknown to him, he can not appraise its true value and worth. Under such circumstances the natural and

justified inclination of those in charge of painting operations is to turn to materials of which the composition and proportions are known and those in particular which have stood the test of time on jobs on which accurate data are available. It always pays to buy from reputable firms.

Stabilized Gravel for Secondary Roads

A rough inventory of our national highway system reveals that of the 3,000,000 miles of public roads in this country, about one half are unimproved. Approximately 500,000 miles are of the so-called improved type, consisting of drained and graded earth but unsurfaced, and about 250,000 miles are surfaced with varying quantities of gravel, crushed stone or slag.

The improvement of this group of low-type roads, as well as the general improvement in the large mileage of the unimproved types, constitutes one of the major problems confronting the highway engineer today.

Some of these roads will be improved with the higher types of construction, but there are thousands of miles which do not require this heavy expenditure as they lie in areas where traffic is relatively light, both in quantity and type of vehicular units.

Government and State highway engineers have concluded that the gravel, crushed stone or slag road, stabilized with calcium chloride, is one of the types to meet this demand, either as a traffic surface or as a base for the more permanent type of surfacing to follow.

The application of the principles of stability to gravel road construction overcomes the faults of the original gravel road, and assures quality by properly combining the graded materials and soil-fines into a stable mixture.

Tunnel Safety

The effective steps taken by the Sanitary District of Chicago to insure safety in the construction of the intercepting sewers now under way are pointed out in a recent News Letter of the Construction Section of the National Safety Council. These sewers are tunnel jobs, under compressed air. Here are some of the extracts from the specifications:

"The contractor shall furnish and place a sufficient number of fire extinguishers of type approved by the Chicago Board of Underwriters in all buildings at the top of the shaft and in the tunnel.

"The contractor shall provide five or more gas masks of the two-hour type and shall place same in a suitable location for immediate use at the top of the shaft. Each mask shall be installed in a metal cabinet with breakable glass door. Each cabinet shall be equipped with a spare oxygen tank, flashlight and tools for adjustment of masks.

"The masks and self rescuers shall be maintained in a first-class condition and shall be inspected at least once a week by a competent inspector.

"Instruction on the use of the masks and the self rescuers shall be given to all employees and proper warnings

shall be posted at top of shaft against entering tunnel in case of fire or evi-

dence of gas, without the use of gas masks."



SAVE ON HANDLING COSTS WITH THE UTILITY SPRAY TANK

Contractors and Highway Departments who use the Littleford No. 101 Utility Spray Tank no longer have to load trucks with drums of material to be distributed along the roadside. They load this outfit with bulk material, hitch it to a truck or tractor and are ready to apply material. They save on handling and eliminate cost of packaging.

No. 101 is made in sizes from 300 to 800 gallons—mounted on two or four-wheeled trailer. One hand-spray and an auxiliary spray bar are standard equipment. Air-cooled engine, Viking pump, heat flue and oil burner are included—handles any kind of bituminous material.

Let us tell you more about No. 101, the most remarkable low-cost maintenance unit yet to be offered the highway industry.



LITTLEFORD

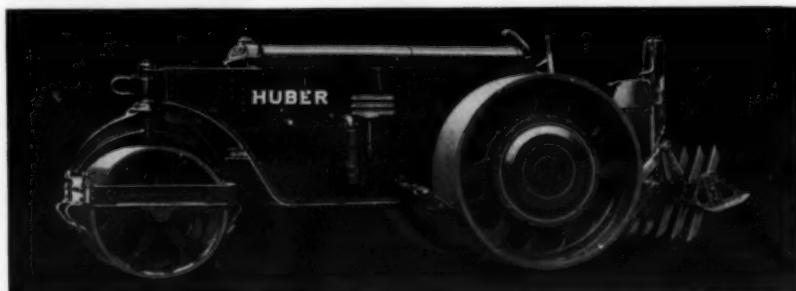
Road Maintenance Equipment
SINCE 1900

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WATCH

HUBER

Watch Huber if you want the most modern road roller value ever offered to the contractors of America. The 5-6-7 or 8 Ton 6 cylinder roller illustrated below contains every modern feature such as full hydraulic control, dual steering (hand or power); removable roller rims; short turns; four speeds forward and reverse; high travel speed; powerful heavy-duty engine. A post card will bring complete specifications and prices.



THE HUBER MANUFACTURING CO., MARION, OHIO



Complete crushing, screening and loading plant with primary jaw crusher, secondary roll crusher and power unit. A capacity wonder.

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UNIVERSAL CRUSHER COMPANY
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Not an experiment
Oldest of its type
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for BETTER ROADS
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Central States Waterworks Assn.

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800 ROOMS
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PITTSBURGH, PA.

Bulletins and Pamphlets

For free distribution to contractors, engineers and officials. Write for the catalogs you need.

A Powerful Independent Shovel Crowd

384 Northwest says it has the simplest, most powerful independent crowd on its shovel of any one on the market today. Full details and reasons may be secured from Northwest Engineering Co., 1727 Steger Bldg., 28 E. Jackson Blvd., Chicago, Ill.

Moving Wet Concrete Easily

385 The new F-25 Lansing contractors' barrow easily handles 4 cubic feet of wet concrete per load because it is equipped with a pneumatic rubber tire and roller bearings. The literature and prices of Lansing Co., Lansing, Mich., will interest you.

Corrugated Culvert for Adequate Drainage

386 Gohi Culvert Mfrs., Inc., Newport, Ky., representing the group of fabricators of Gohi pure iron-copper alloy culverts which withstand the severest abuse and punishment and have a record of longevity, will be pleased to supply you with prices and details of stocks and prompt shipments.

Rotogravure Magazine on Power Shovels

387 American Hoist & Derrick Co., St. Paul, Minn., will be glad to send you a copy of its new interesting free rotogravure magazine, "American Gopher Shovels" which shows the Model 450 1½-yard power shovel on the job.

Crawler Tractors That Start Easier

388 A-C oil tractors have a reputation for starting quickly with a push on the starter or a couple of turns on the crank. Allis-Chalmers Tractor Division, Milwaukee, Wis., will be glad to furnish you the facts as to why A-C oil tractors start quicker and operate with fewer repairs.

Steel and Aluminum Straight-Edges

389 Straight-edges that stay straight and last longer because there are two usable edges, one sharp cornered and squared for dragging, and the other rounded for checking, are made by the L & M Mfg. Co., 10302 Berea Road, Cleveland, Ohio. Ask for the Giantgrip straight-edge circular.

Steel Forms for Concrete Work

390 Bulletin 200 just off the press gives all the details you want to know about Heltzel steel forms for building concrete roads, sidewalks, curbs and gutters, manholes, pipes, walls, sewers, tunnels and special construction projects. Get your copy from Heltzel Steel Form & Iron Co., Warren, Ohio.

44-Page Catalog on a New Diesel

391 A 44-page catalog, 2538, has recently been published by the Caterpillar Tractor Co., Peoria, Ill., featuring the new Diesel Forty tractor. The new booklet is printed in two colors and makes use of model and action pictures to illustrate the text. Copies may be secured by writing to Caterpillar.

Metal Cribbing Solves Many Problems

392 Armco metal cribbing used by railroads to repair broken wing walls, to solve road-widening problems, for stabilizing road shoulders, to prevent stream encroachment, to hold a sliding cut plus many other uses is described in a leaflet which may be secured from the Armco Culvert Mfrs. Association, Middletown, Ohio.

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Please send me the following
literature, without cost or obligation
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P.S. Also send me catalogs and prices on—

Distributor With No-Drip Nozzles

393 The Model C pressure distributor made by Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio, is described in literature which will be sent you promptly on request. This distributor heats rapidly, applies accurately and the nozzles don't drip.

Powerful Hand Hoists for Many Jobs

394 The Beebe all-steel hand hoist, which only weighs 110 pounds and will handle 5 tons, is a unit worth having on any job. Send to Beebe Bros., 2724 Sixth Ave., South, Seattle, Wash., for the name of your nearest dealer.

Detachable Bits for Rock Drills

395 Crusca detachable bits, in various sizes and designed for efficiency in rock drilling, are described and illustrated in literature which the Crucible Steel Co. of America, 405 Lexington Ave., New York City, will be glad to send on request to those interested.

Hydraulic Hoists for Heavy Duty

396 Wood underbody slant-type hydraulic hoists for heavy-duty dump trucks, a feature of which is the patented cam and roller action, are described in literature which Gar Wood Industries, Inc., 7924 Riopelle St., Detroit, Mich., will be glad to send on request.

External Clamps for Construction Jobs

397 Williams external clamps, a feature of which is that they operate only externally, are described and their various uses illustrated in a new catalog which the Williams Form Engineering Corp., 746 Cherry St., Grand Rapids, Mich., will be glad to send on request.

Reduction Crushers

398 The Bonnot Co., Canton, Ohio, will be glad to send to interested contractors its literature describing and illustrating the ten features of the Bonnot reduction crusher, which is made in two sizes with capacities ranging from 15 to 90 tons per hour.

Tents, Tarpaulins and Windbreaks

399 The Fulton line of tents, tarpaulins and windbreaks is sold through contractors' supply dealers in every state. Write to Fulton Bag & Cotton Mills, Atlanta, Ga., for the name of your nearest dealer.

Belt Conveyors That Move Mountains

400 The Jeffrey Mfg. Co., 949-99 No. Fourth St., Columbus, Ohio, maker of all kinds of belt conveyors for handling dirt and other construction material, and the manufacturer of the mile of Jeffrey conveyors which are moving a mountain at Grand Coulee, will be pleased to send complete information on heavy-duty belt conveyors for any job, large or small.

Material Producing Equipment

401 Portable quarry and gravel plants, screening and loading plants, vibrating screens, roll crushers, jaw crushers, asphalt hot-mix plants and traveling road mix plants are among the Cedar Rapids material producing and handling plants which may interest you. The latest catalog of the Iowa Manufacturing Co., Cedar Rapids, Iowa, gives the details and is yours for the asking.

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402 Processed Kyrock for hot and cold-mix non-skid surfaces, a new development which combines the qualities of natural Kyrock with additional asphalt completely amalgamated with the aggregate, is described in a new booklet which the Kentucky Rock Asphalt Co., Louisville, Ky., will be glad to send on request.

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Aftercoolers for Large Compressors

403 Bulletin No. 9212, describing and illustrating the various types of Ingersoll-Rand aftercoolers for large compressors, explaining the reasons for the use of aftercoolers and how the different types fit into certain compressor plant conditions, may be secured by those interested from Ingersoll-Rand Co., 11 Broadway, New York City.

Increased Gyratory Crusher Efficiency

404 Traylor patented non-chokable bell head and curved concaves, which are claimed to increase the efficiency of gyratory crushers 100 percent, and which can be used to convert any gyratory into a first class fine reduction crusher, are described in literature which Traylor Engineering & Mfg. Co., Allentown, Penna., will be glad to send to those interested on request.

A Tractor Derrick for Many Uses

405 Literature describing the Le Tourneau tractor derrick for loading and unloading heavy equipment, laying pipe, placing pole lines, erecting bridge members and similar uses may be secured by interested contractors and engineers from R. G. Le Tourneau, Inc., Peoria, Ill.

Self-Priming Centrifugal Pumps

406 Domestic full-capacity dirt and trash handling drainage pumps for sewer bridge, excavating and road contractors are described and illustrated in literature which the Domestic Engine & Pump Co., Shippensburg, Pa., will be glad to send free on request.

Complete Line of Jacks

407 A new catalog No. 235 fully illustrating and describing Simplex screw and lever jacks, trench and timber braces for use by contractors and highway departments may be secured by those interested direct from Templeton, Kenly & Co., 1020 So. Central Ave., Chicago, Ill.

Hydraulic Hoist Bodies

408 Anthony hydraulic hoist bodies, in a variety of sizes and types to meet the various requirements of road construction and maintenance, are described and illustrated in literature which the Anthony Co., Streator, Ill., will be glad to send on request.

A Complete Line of Rotary Tools

409 Catalog SP-1876, describing and illustrating the complete C-P line of Power Vane rotary tools, including drills, grinders, concrete surfacers and similar items, may be secured free on request from the Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.

Heavy Mineral Coated Electrodes

410 Literature describing Murex heavy mineral coated electrodes in various types to meet all welding requirements may be secured by those interested from the Metal & Thermit Corp., 120 Broadway, New York City.



The New Tel Smith Heavy-Duty Pulsator

New Heavy-Duty Screen Vibrates Uniformly

A heavy-duty vibrating screen known as the Pulsator has been designed by the Smith Engineering Works, 4014 No. Holton St., Milwaukee, Wis., to screen wet or dry sand, gravel or crushed rock. The eccentric action of the Pulsator produces a circular movement which causes the

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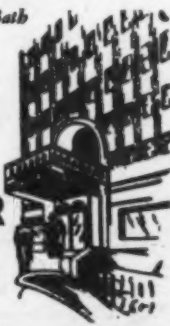
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New Pumps and Hoists
Gardner Apparatus
Page Buckets
Rogers Bros. Trailers
Sargen Derricks
Shank Grader Blades
Toledo Torches
Truckson Tractors
Universal Center, Accessories
Vulcan Pipe Equipment
Webb Graders
Western Road Machinery
Worthington Pumps
Wyoming Shovels

Equitable Equipment Co., Inc.

410 Camp Street New Orleans, La.
BROWNING Cranes and Shovels
CAMERON Centrifugal Pumps
CEMENT GUN Gunting and Equipment
CUMMINS Diesel Engines
DEAN BROS. Steam and Power Pumps
EDGE MOON Water Tube Boilers
GENERAL ELECTRIC Motors, Arc Welders, etc.
HYDROLIC Goids Oil Purifiers
INGERSOLL-RAND Air Compressors, Pumps, Tools
INTERNATIONAL Nickel, Steel Metal, Insect
MERRILL Pipe Machines
MOORE Steam Turbines, Reduction Gears
MORRIS Dredging Machy.
MUNDY Hoisting Engines
NEW Pumps and Hoists
PLYMOUTH Gas and Diesel Locomotives
CRANE
WITH Concrete Mixers
WITHERS-ADAMSON Conveyors
TRAY-ESBERG Generators, Steam Engines and Boilers
WEIR-KILBY Press and Switches
WELDON Tanks, Pipe Barges, Pontoons
WELDON Reels and Equipment

FLETCHER EQUIP. CO., INC.
300 Magazine Street
New Orleans, La.

Representing
ARCHER Towers and Chuting Equipment
BUTLER Bins, Batches
CLYDE Hoisting Engines and Derricks
FREEMAN Turntables
GALION Graders, Rollers
LE ROI-RIX Portable Air Compressors
LE ROI Gas Engines
LINK-BELT Draglines, Cranes and Shovels
LITTLEFORD Heaters, Rollers
Member: Associated Equipment Distributors

ALBAN TRACTOR CO., INC.
725-27 East 25th St. Baltimore, Md.

Representing
"CATERPILLAR" Diesel Tractors, Motors
"CATERPILLAR" Road Machinery
"CATERPILLAR" Combine Harvesters
GENERAL Excavators
GRAVEL Power Mowers, Plows
KILFEE Tillage Tools
LINK-BELT Shovels and Cranes
EUCALOID ROAD MACHINERY CO.
CLEVELAND ROCK DRILL CO.
BARNER MFG. COMPANY
LA PLANT-CHATEAU MFG. CO.
BARCOCK MFG. CO.
WILLAMETTE-ERSTED CO.
BAKER MANUFACTURING CO.
ROTARY SNOW PLOW CO.
ATHEY TRUSS WHEEL CO.
REX-WATSON CORPORATION
DAVEY AIR COMPRESSOR CO.
BLAW-KNOX Bulldozers, Dismanters
Member: Associated Equipment Distributors

D. C. ELPHINSTONE, INC.
115 S. Calvert St. Baltimore, Md.
976 National Press Bldg.
Washington, D.C.

Representing
Kuehling Co.
Kwik-Mix Co.
Lafayette Mfg. Co.
Parsons Co.
C. H. & E. Mfg. Co.
Geo. H. Hays Co.
Sawmox Bros. Inc.
Allis-Chalmers Mfg. Co.
Gardner-Denver Co.
Linn Mfg. Corp.
Dunn Buckle Co.
Lafayette Mfg. Co.
Emerson Pump & Valve Co.
Member: Associated Equipment Distributors

JOHN C. LOUIS COMPANY
511 W. Pratt St. Baltimore, Md.

Representing
JAEGER-Concrete Mixers, Pumps, Truck Mixers, etc.
LAWWOOD-Finishers, Forms, Towers
AMERICAN CABLE-Tru-Lay Wire Rope
NORTHWEST-Cranes, Shovels, Draglines
BUTLER-Bins
CENTAUR-Comb Mowers
WORTHINGTON-Comp-pressors, Drills, etc.
ADAMS-Leaning-Wheel Graders
Member: Associated Equipment Distributors

THE HENRY H. MEYER CO.
110 S. Howard St., Baltimore, Md.
628 Munsey Building, Washington, D.C.

Representing
Blaw-Knox Co.
Blaw & Leckport Bl. Co.
Byers Machine Co.
Phillips Carey Co.
Chas. Oil Burner Co.
Conery & Co., Inc.
Domestic Eng. & Pump Co.
Bobbie Perry & Mack, Co.
Duff-Norton Mfg. Co.
Gallen Iron Works & Mfg. Co.
A. B. Farquhar Co., Ltd.
Harrington Co.
Member: Associated Equipment Distributors

CLARK-WILCOX COMPANY
790-798 Albany St. Boston, Mass.

Representing
RANSOME-Concrete Mixers, Chuting Equip.
NORTHWEST-Cranes, Shovels, Draglines
BLAW-KNOX-Steel Forms, Bins, Buckets, "Ord" Fin-
CARTER-"Humdinger" Pumps
INGERSOLL-RAND-Air Compressors
ORR-SENBOWER-Hoists, Rollers, Mixers
RODS-Shore and Clamps
HAUCK-Oil Burners and Heaters
HAISS-Elevators, Conveyors and Loaders
ALLIS-CHALMERS-Tractors
BAKER-Bulldozers
SARGENT-Plows
REEBE BROS.-Hoists
CLEVELAND-Formgraders
C. E. JAHN CO.-Trailers
BURNCH-Hoist Pliers, Road Machinery
Member: Associated Equipment Distributors

THE EQUIPMENT CO.
30 Prentiss St. Boston, Mass.

Representing
Link-Belt Cranes and Shovels
Ingersoll-Rand Compressors and Tools
"Williams" Buckets and Trailers
Homelite Pumps and Generators
COMPLETE RENTAL SERVICE
Member: Associated Equipment Distributors

HEDGE & MATTHEIS CO.
285 DORCHESTER AVE. BOSTON, MASS.

Representing
Aeroli Burner Co.
American Tubular Elevator Co.
Austin Machinery Corp.
Beaumont-Birch Co.
Electric Tamping & E. Co.
Erie Steel Construction Co.
Hercules Motors Corp.
Huber Mfg. Co.
Ingersoll-Rand Co.
Iowa Mfg. Co.
Jasper Machine Co.
Jones-Superior Mach. Co.
Kelley Electric Machine Co.
Lakewood Engineering Co.
LeRoy Company
A. Leeson & Sons Rope Co.
McKiernan-Terry Corp.
Lambert Nat'l Hoist, Div.
The Ohio Power Shovel Co.
Red Star Corporation
Sargen Derrick Co.
Timken Roller Bearing Co.
Tolsted Pressed Steel Co.
Universal Form Clamp Co.
Webb Company
Wood Shovel & Tool Co.
Member: Associated Equipment Distributors

THOMAS G. ABRAMS, INC.
Construction Equipment
2411 Fourteenth St. Detroit, Mich.

Representing
Aeroli Burner Co.
Archer Iron Works
Brookville Locomotive Co.
(McCormick-Deering Power)
Butler Bin Company
Burch Corporation
Byers Machine Co.
Domestic Engine & Pump Co.
LeRoy-Rix Compressors
St. Regis Paper Company
Sargen Derrick Company
T. L. Smith Company
Smith Engineering Works
Sterling Wheelbarrow Co.
Tolsted Pressed Steel Co.
Member: Associated Equipment Distributors

KELLER TRACTOR & EQ. CO., Inc.
5163-69 Martin Ave., Detroit, Mich.

Representing
Attee-Dirt-moving equipment and bulldozers
Baker Mfg. Co.-Snow plows, road machinery
Blaw-Knox Company-Finishers, road forms, bins, batches and buckets
Bucyrus-Erie Company-Shovels, cranes, draglines
Chain Belt Co.-Mixers, pavers, pumps
Caterpillar Tractor Co.-Tractors, graders, road machinery
D-A Lubricant Co.-Lubricants
Dittler Mfg. Co.-Electric spreaders
Gardner-Denver Co.-Air compressors and tools
Kilflee Mfg. Corp.-Road and farm tools
LaPlant-Choate Mfg. Co.-Bulldozers, backfillers, wagons, snow plows
A. Leeson & Sons Rope Co.-Wire rope
E. D. Etnyre & Co.-Oil and tar distributors and heaters
Timken Rock Bits
Universal Crusher Co.-Gravel Equipment
Member: Associated Equipment Distributors

CONTRACTORS MACHY. CO.
530 Monroe Ave., N.W. Grand Rapids, Mich.

Representing
Jaeger Machine Company
Lakewood Engineering Co.
Northwest Engineering Co.
Sawmox Machine Co.
Pioneer Gravel Equipment
Mfg. Co.
Butler Bin Company
Clyde Sales Company
Gallen Iron Works
Pavement Engineering Co.
American Steel & Wire Co.
Burch Corporation
Ross Snow Plows
Sargen Derrick Company
Sawmox Brothers
Syntron Company
LeRoy Company
Aeroli Burner Company
Conery & Company
Jones-Superior Company
Meritz-Bennett Company
Ames Shovel
Hove Manufacturing Co.
Red Top Steel Post Company
Tolsted Pressed Steel Co.
Bates Wire Ties
Electric Tamping & Equip. Co.
Sterling Wheelbarrows
Trackson Co.
Member: Associated Equipment Distributors

E. K. S. EQUIPMENT CO.
18 Grandville Ave., S.W. Grand Rapids, Mich.

Representing
ALLIS-CHALMERS-Tractors, Graders, Wagons, Pumps, Units
BERG-Concrete Finishers
CLEVELAND-Air Tools
DIAMOND-Crusher, Gravel Plants, Washing Equipment
FLEXIBLE-Road Joint Machines
FOUR-WHEEL DRIVE-Trucks
HELTZEL-Forms, Bins, Road Sweepers
HOUGH-UNIVERSAL-Road Sweepers
HUBER-Rollers
INSLEY-Towers, 1/2-yd. Shovels
Kuehling Co.-Shovels, Cranes
KWIK-MIX-Mixers
LITTLEFORD-Kettles, Gravel Plants, Washing Equipment
WATSON-Snow Fence
MACVAYTE-Wire Rope
NOVO-Engines, Pumps, Hoists
PARSONS-Trenchers, Graders, Asphalt Machinery
SCHRAMM-Air Compressors, Tools
SHOVELS, PICKS and SMALL TOOLS
Member: Associated Equipment Distributors

BORCHERT-INGERSOLL, INC.
St. Paul, Minn. Duluth, Minn.

Representing
Allis-Chalmers Tractors and Graders
"American" Bulldozers, Snow Plows
Blaw-Knox Bins, Forms, Buckets, Finishers
B-B Hand Hoists
Clyde Hoists, Derricks
Cleaveland Formgraders
Diamond Crushers, Screens
Domestic Pumps
Eucaloid Wagons, Scrapers
Gagher Road Signs
Hais Leaders
Hercules Road Rollers
Hough-Universal Sweeper
Koppel Industrial Cars
McKiernan-Terry Pile Hammer, Extractors
M-W Lubricants
Michigan Power Shovel
Northern Conveyors
Northwest Shovels, Cranes
Johkash 4-whe. Dr. Trucks
"RB" Power Subgraders
Smith Mixers, Pavers
Sullivan Compressors, Tools
Tere Highway Mowers
Whitecomb Locomotives
Member: Associated Equipment Distributors

LANGE TRACTOR & EQ. CO.
304 Lake Ave., S. Duluth, Minn.

Representing
Aeroli Tar Kettles, Heaters
Caterpillar Road Machinery and Tractors
LaPlant-Choate Wagons, Bulldozers, Snow Plows, Scrapers
Koytose Excavators, Blast Hole Drills
Diamond Gravel Crushing, Screening, Washing
Pliers, Conveyors
Kilflee Scrapers, Road Discs, Rippers
Davey Air-Cooled Air Compressors
Cleaveland Rock Drills
Lambert Wagons
Blaw-Knox Ateco Scrapers, Bulldozers
Hansen Gas Shovels, Trailers
Williamette-Ersted Hoists and Winches
Wauau Tractor and Truck
Brookville Gas and Diesel Locomotives
Oakleaf Four-Wheel Drive Trucks
Anthony Power Loaders
Leach Concrete Mixers
MacWhirly Wire Rope
Highway Earth Boring Machines
Ames Baldwin Wyoming Hand Shovels
Member: Associated Equipment Distributors

THORMAN W. ROSHOLT CO.
928 So. Fourth St. Minneapolis, Minn.

Representing
IOWA "Cedar Rapids" Crusher Plants and Equipment
KOEHRING Pavers, Mixers, Cranes
INSLEY Towers and 1/2-yard Shovels
PARSONS Trenching Machines, etc.
McCORMICK-DEERING Industrial Tractors
C. H. & E. Saw Rigs, Hoists, Pumps
KWIK-MIX Mixers
RIDDLELL Power Grader
JOHNSON Batches and Demountable Bins
Trackson Loaders and Cranes
BYERS Shovels and Cranes
VULCAN Steam and Gas Locomotives
LIDGERWOOD Hoists
SARGENT Snow Plows
METAL FORMS CORP. Steel Forms
ROSCO Trailers and Bituminous Distributors
STOCKLAND Graders
WALTER Trucks
GORMAN-RUPP CO. Self-priming Centrifugal Pumps
Member: Associated Equipment Distributors

WM. H. ZIEGLER CO., INC.
Cincinnati, St. Paul, Duluth, Minn., Glasgow, Mont.

Representing
"CATERPILLAR" - Tractors, Engines, Road Machinery
LA PLANT-CHATEAU Bulldozers, Snow Plows, Dump Wagons
Le TOURNEAU - Dirt Moving, Road Equipment
KILFEE-Road Rippers, Scrapers
ATHEY-Crawlers, Dump Trucks
Bucyrus-Erie - Power Shovels, Cranes, Draglines
PIONEER-Crusher, Gravel Plant
REX-Mixers, Pavers, Saw Rigs
BUTLER-Bins, Batches
BARBER-GREENE - Conveyors, Loaders, Ditchers
F. W. D. - Four-Wheel Drive Trucks
PLYMOUTH-Locomotives
GARDNER-DENVER-Air Compressors, Drills
LAPEER TRAILMOBILE Semi-Trailers
LESCHE-Wire Rope
BLAW-KNOX - Madison Paving Plants, Ateco Scrapers
LITTLEFORD - Oil Distributors, Tar Kettles, Heaters
"WILLIAMS" - Buckets and Heavy-Duty Trailers
HYPERPRESSURE JENNY-Spray Cleaners
Member: Associated Equipment Distributors

BUBLITZ MACHINERY CO.
2141 Washington St., Kansas City, Mo.

Representing
Jaeger Machine Co.
Lakewood Engineering Co.
Thaw Shovel Co.
Barber-Greene Company
Ames Manufacturing Co.
McKiernan-Terry Corp.
Worthington Pump & Mfg. Co.
Whitcomb Locomotive Co.
Butler Bin Co.
"Williams"-Buckets and Trailers
Sawmox-Bulldozers
Ames Baldwin Wyoming Co.
MacWhirly Co.
Red Star Products Co.
Sargen Derrick Co.
Climax Engineering Co.
Member: Associated Equipment Distributors

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1325 Macklind Avenue St. Louis, Mo.

Exclusive Distributors for
American Steel Works
Austin-Western Road Machinery Co.
Blaw-Knox Co.
Chain Belt Co.
Dayton-Sure Grip & Shere Co.
C. R. Jahn Co.
Kewanee Machinery & Conveyor Co.
Kob Manufacturing Co.
McKiernan-Terry Corp.
Northwest Engineering Co.
R. B. Equipment Mfg. Co.
Sullivan Machinery Co.
Vulcan Locomotive Works
Koppel Industrial Car & Equip. Co.
Member: Associated Equipment Distributors

CORBY SUPPLY COMPANY
3942-46 W. Pine Blvd., St. Louis, Mo.

Representing
DETROIT HOIST & MACH. CO.-Air and Electric Hoists
BUCKEYE TWIST DRILL CO.-Twist Drills and Beam-cts
BUHL CO.-Portable Air Compressors
CHAMPION RIVET CO.-Rivets and Welding Rod
DETROIT HOIST & MACH. CO.-Air Hoists
HARDSCOG WONDER DRILL CO.-Rock Drills, Paving Breakers
WM. H. KELLER, INC.-Super Pneumatic Tools
PENNSYLVANIA-Air Compressors and Pumps
DAVID ROUND & SON-Chain Hoists
RIVET CUTTING GUN CO.-Rivet Busters
N. A. STRAND & CO.-Flexible Shaft Equipment
UNION-Portable Woodworking Tools
VAN DORN-Electric Drills, Grinders, Buffers
VICTOR-Welding and Cutting Torches
WESTINGHOUSE-Arc Welding Equipment
GUSTAV WIEDEKE & CO.-Tube Expanders
Member: Associated Equipment Distributors

JOHN FABICK TRACTOR CO.
Gravois & Iowa Aves. St. Louis, Mo.

Representing
Athey Truss Wheel Co.
Cleaveland Rock Drill Co.
Blaw-Knox Company
Caterpillar Tractor Co.
Davey Compressor Co.
Euclid Road Machinery Co.
Kilflee Mfg. Co.
LaPlant-Choate Mfg. Co.
Pioneer Gravel Equip. Mfg. Co.
Thaw Shovel Company
Williamette-Ersted Co.
W. K. M. Company
Member: Associated Equipment Distributors

JOSEPH KESL TRACTOR & EQUIP. CO.
1510 North 13th St. St. Louis, Mo.

Representing
Allis-Chalmers Mfg. Co.
American Steel Scraper Co.
The Baker Mfg. Co.
Wm. Bro. Boiler & Equip. Co.
Cushman Motor Works
Erie Steel Construction Co.
Gardner-Denver Co.
General Wheelbarrow Co.
Lyle Sigs. Inc.
Wall Tool Co.
Tolsted Pressed Steel Co.
Aeroli Burner Co., Inc.
Contractors Machinery Corp.
Domestic Engine & Pump Co.
Iowa Manufacturing Co.
D. & S. S. S. Co.
Mack Weldridge Co., Inc.
Member: Associated Equipment Distributors

C. F. RABBEIT, INC.
1523 N. Broadway St. Louis, Mo.

Representing
C. H. & E. Mfg. Company
Clemmer-Brooks Company
Cleaveland Formgrader Co.
Huber Mfg. Company
Insley Mfg. Company
Kuehling Company
Kwik-Mix Mixer Co.
Lidgerwood Mfg. Company
Littleford Bros.
Parsons Company
Union Iron Works, Inc.
Butler Bin Company
Frank G. Hough Company
Metal Form Corp.
Thorman W. Rosholt Co.
Sterling Machinery Corp.
Member: Associated Equipment Distributors

THE GEO. F. SMITH CO.
Franklin & Channing Aves., St. Louis, Mo.
Complete Plants Rented

Representing
Ingersoll-Rand-Compressors, Air Tools
Clyde-Hoists and Derricks
Owen-Clamshell Buckets
Hauk-Heaters
Sargen-Derricks & Winches
Skilaw-Electric Saws, Drills
Skilton-Shovels
Lafayette-Engines
Sawmox-Column Clamps
Winlow-Weighing Scales
Universal-Form Clamps
Link-Belt-Cranes, Shovels, Draglines
Novo-Pumps
Vulcan-Steam and Drop Hammers
Wanksha-Engines
Mail-Vibrators and Grinders
Archer-Tower Equipment
Red Star-Wheelbarrows and Shovels
Templeton, Kenty & Co.-Trench Braces, Jacks
Smith-Mixers, Pavers
Vail-The Wire and Tools
American Steel & Wire-Rope
Member: Associated Equipment Distributors

TULLEY EQUIPMENT CO., INC.
4215 Clayton Ave. St. Louis, Mo.

Representing
ORTON-Cranes, Shovels, Draglines, Buckets
LEACH-Mixers, Tower Outfits, Saw Rigs
ROGERS BROS.-Trailers
HUMPHREYS-Pumps
MILWAUKEE-Gasoline Locomotives
McLANAHAN & STONE-Crushers, Screens
Reinforcing Steel and Accessories
Asphalt and Rubber Expansion Joint
Road Building Materials
Member: Associated Equipment Distributors

CONNELLY MACHINERY CO.
2706 Montana Ave. Billings, Mont.

Distributors of
Caterpillar Tractors, Engines, Road Machinery
Pioneer Gravel Plant Equip.
Bucyrus-Erie Shovels, Draglines and Cranes
Bucyrus-Erie Loadmasters
Buckeye Ditchers, Backfillers
Buffalo-Springfield Road Builders
D-A Lubricants, Oils
Hewitt Belting, Hose
Tractor-operated Hoists, Scrapers, Dismanters, Rippers, Sawmox, Bulldozers, Trailblazers, Backfillers, Snow Plows, Loaders, Track-type and Wheeled Wagons and Trailers, etc.
Le Tourneau Dirt Moving, Road Bldg. Equip.
Kuehling Lightening Plants
LaCrosse Tu-Way Trailers
Hough-Universal Road Sweepers
Standard Paving and Plant-Mix Oiling Plants
Distributors-Trailers Oil-Burners and Derricks
Leschen's Wire Rope
Member: Associated Equipment Distributors

MIDLAND IMPLEMENT CO., Inc.
Billings Montana

Representing
FORDSON-Tractors and Industrial Equipment
BARBER-GREENE-Conveyors, Ditchers and Loaders
DIAMOND IRON WORKS-Gravel Equipment
BENNETT-Rippers and Scarifiers
WOOD-Wire Snow Fence
HYSTER-Hoists and Winches
LANSHAM-Scrapers, Presses and Barrows
SCHRAMM-Compressors
WHEELING CORRUGATING CO.-Metal Culverts
KOEHRING-Shovels, Drag Lines and Concrete Mixers
LINK-BELT TRUCK FLARES
BRODERICK & BASCOM WIRE ROPE CO.-Wire Rope and Cable
ROSCO-Trail Dumpers and Oiling Equipment
WM. BROS MFG. CO.-Snow Plows and Rollers
GODRICHT-Transmission and Conveyor Belting
KENSINGTON-Crusher Jaws, Caterpillar Treads, etc.
CLEVELAND-Rock Drills
Member: Associated Equipment Distributors

HALL-PERRY MACHINERY CO.
802-12 E. Iron St., Butte, Mont.

Representing
American Cable Co.
Atlas Imperial Diesel Eng. Co.
Butler Bin Co.
Chain Belt Co.
Climax Engineering Co.
Elgin Corporation
Etnyre & Co.
Gallen Iron Works & Mfg. Co.
Gardner-Denver Co.
Goodyear Tire & Rubber Co.
Hansen Trailers
Hazard Wire Rope Co.
Madison Iron Works
M. A. M. & H. Co.
McHawk Asphalt Heater Co.
Novo Engine Co.
Ransay Winches
Rotary Snow Plow Co.
Sawmox Bros., Inc.
Smith Engineering Works
Thaw Shovel Company
Timken Roller Bearing Service & Sales Co.
Trackson Company
Willott Mfg. Co.
Mack Weldridge Co.
Member: Associated Equipment Distributors

NORTHWEST EQUIP. CO., Inc.
Box 1112 Great Falls, Mont.

Complete Line of Road Machinery and Contractors' Equipment
Representing
KOEHRING-Mixers, Pavers, Shovels
PARSONS-Trenchers
T. L. SMITH-Mixers and Pavers
INSLEY-Concrete Towers & Chuting, Shovels
PANTHER-Oil and Grease
OWEN-Buckets
COLEMAN-Trucks
SCHRAMM-Air Compressors
PIONEER-Gravel Equip.
MACWHYTE-Hoist, Plows, Scrapers, Presses, etc.
CLEVELAND-Rock Drills
STEEL BRIDGES AND TRAFFIC TREAD
Member: Associated Equipment Distributors

HEYNIGER BROTHERS

Contractors' Equipment

6th Ave. and F St. Belmar, N. J.

JAEGER Concrete Mixers
JAEGER Placing Plants
AEROIL Torches, HeatersSteel Sidewalk and
Curb Forms
"Mud Hog" Pumps
Material Elevators
Air Compressors
Gasoline Hoists
Trench Pumps
Carbide Lights
Wheelbarrows
Mortar Tubs
Steel Mortar Boxes
Picks and Shovels
Tarpaulins
Scaffold Horses
Electric Drills & Saws
Chain Hoists**DALE & RANKIN, INC.**

113 Frelinghuysen Ave., Newark, N. J.

Representing

HELTZEL Road Forms and Bins
P & H Cranes and Excavating Equipment
P & H Hansen Electric Arc Welders
INGERSOLL-RAND Compressors and Tools
STERLING Wheelbarrows
AEROIL Heaters and Tools
ALEMITE Guns and Fittings
REX Mixers and Pavers
REX Saws
UNIVERSAL Concrete Accessories
WINSLOW Scales

Member: Associated Equipment Distributors

JOHNSON & DEALAMAN, INC.

60 Marshall Street Newark, N. J.

Representing

RANSOME Pavers, Mixers, Churning Equipment
SCHRAMM Air Compressors, Tools
ALLIS-CHALMERS Tractors, Graders
JAEGER-LAKEWOOD Road Finishing Machines, Truck
Mixers, Road Pumps
JOHNSON Steel Bins and Batches
ERIE Gasoline Rollers
BAY CITY Truck Cranes
MARLOW Centrifugal, Diaphragm and Plunger Pumps
ETNYRE Tar and Asphalt Distributors
WILLIAMS Trailers and Buckets
RED STAR Wheelbarrows, Batch Boxes, Column Clamps
and Adjustable Scales
OSGOOD Shovels, Cranes and Draglines
GENERAL Shovels, Cranes and Draglines
HOTCHKISS Road and Sidewalk Forms**SLADE TRACTOR CO., Inc.**

36 Learned Street Albany, N. Y.

Representing

"CATAPILLAR" Tractors, Road Machinery, Combines
LAPLANT-CHATEAU Track Wheel Wagons, Bulldozers
and Snow Blows
EUGLID Rotary and Wheel Scrapers, Track Wheel Wagons
KILFER Agricultural Implements and Contracting Tools
WILLAMETTE-HYSTER Hoists for "Caterpillar" Trac-
tors
ATHEY TRUSS Wheel Wagons and Trailers
DETROIT HARVESTER Mowers and Snow Brush
SCHRAMM Air Compressors
W-K-M Boms for "Caterpillar" Tractors
DORSEY Stump Puller
BLAW-KNOX Atco Equipment
MICHIGAN Power Shovels
CENTAUR Hi-way Mowers**DOW & COMPANY, INC.**

"Equipment for Highways"

Court & Wilkeson Sts., Buffalo, N.Y.

C. H. & E.—Pumps, Hoists, Saw Rigs
BARCO—Gasoline Hammers
CHICAGO PNEUMATIC TOOL CO.—Compressors, Drills
ADAMS—Leasing Wheel Graders
BURN—Spreaders, Maintainers, etc.
TONGAN—Corrugated Culverts
EUGLID—Earth-Moving Equipment
HOUGH-UNIVERSAL—Sweepers
MCCORMICK-DEERING—Tractors
"METAFORMS"—Concrete Forms
MORAWK—"Hotstar" Kettles, Burners
THEW-LORAIN—Shovels, Cranes
UNIVERSAL-LORAIN—Shovels, Truck Cranes
T. L. SMITH—Mixers, Pavers, Tower Pavers
"WILLIAMS"—Buckets, Trailers
WILLIAMSPORT—Wire Rope
WALTER—Snowblowers, Tractor Trucks
FRANK—Saw Piles**LLOYD G. ROSS**

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Equipment**EUGENE F. VAN NAME**

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Representing

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A-W—Traffic Tread
BAKER—Road Drags, Snow Plows
C. M. C.—Wonder & Marsh-Capron Mixers
HUBER—Rollers
HOTCHKISS—Sidewalk Forms
HANSON—Excavators
INGERSOLL-RAND—Air Compressors
JACKSON—Wheelbarrows
MILES—Concrete Block Machines
THE NORTHERN—Gravel & Coal Conveyors
WILLIAMSPORT—Wire Rope
WISCONSIN SPECIAL—Snow Plows**COMPLETE MACHINERY
& EQUIPMENT CO., Inc.**

"Specialists in Pumps"

Webster Ave. and Hancock St.
Long Island City New York

Representing

RALPH B. CARTER CO.—Humdinger Self-
Priming Centrifugal Pumps
HUMPHREYS MFG. CO.—Diaphragm, Plunger
and Centrifugal Pumps
LEACH CO.—Concrete Mixers
INGERSOLL-RAND CO.—Air Compressors
COMPLETE—Well Point Systems
—Steel Blasting Mats—
RENTAL SERVICE
Member: Associated Equipment Distributors**GEORGE MALVESE & CO.**

New Hyde Park, N. Y.

Long Island Distributors:

CLETRAC Crawler LOCKE Power Mowers
Tractors
PLYMOUTH Tractors REX Pumps, Mixers
ADAMS Graders EUCLID Scrapers
SARGENT Snow OLIVER Implements
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Blaystone Mfg. Co.
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Butler Bin Co.
Chain Belt Co.
Climax Eng. Co.
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Detroit Graphite Co.
DeWalt Products Co.
Eagle Sales Corp.
Fairbanks, Morse & Co.
Fate-Roth-Heath Co.
Garco Manufacturing Co.
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Hoist Power Lawn Mower Co.
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Behram, Inc.
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Contractors and Engineers Monthly



C. & E. M. Photos

The 5-mile Apalachicola Bay combined bridge and causeway in Florida, an important link in the scenic Gulf Highway which will soon extend from Galveston, Texas, to Tallahassee, Florida, will supplant the State's free ferry service. The photographs show the work of Doullut & Ewin, of New Orleans, La., one of the five contractors on this \$1,129,838.44 PWA project. LEFT, workmen in the contractor's yard at Apalachicola making the splices of the untreated and creosoted piles, using four oak splines with four bolts in each pile.

ABOVE, pile bents for one of the long wood trestles, showing the accurate batter of the outer piles made possible by the swinging leads on the pile driving barge. Note the use of saplings to tie the piles of each bent before capping. The pile-driving portion of Doullut & Ewin's contract is described on page 5.



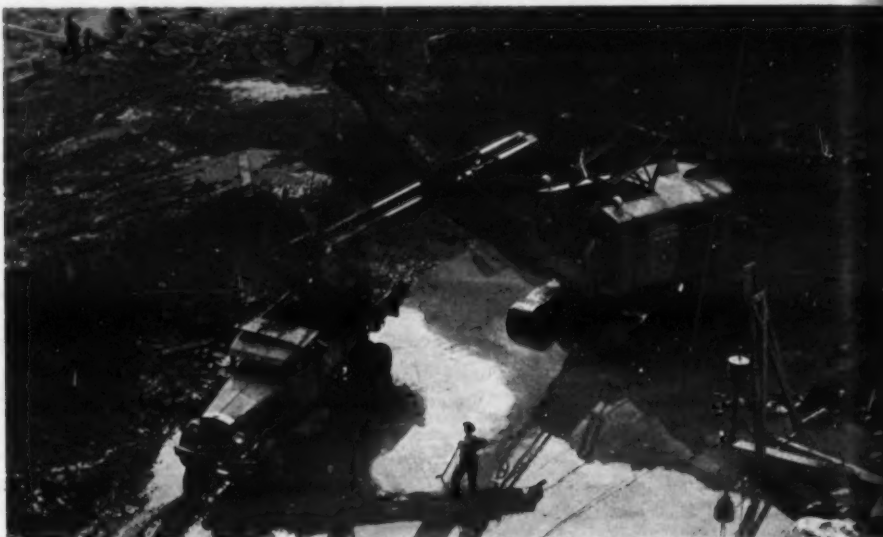
C. & E. M. Photo

R. C. Pierce, Vice President and Treasurer of Wilbanks & Pierce, Inc., of New Orleans, La., who designed the new diesel dredge Manatee which pumped 12,000 cubic yards, dry measurement, every 24 hours on the 2,200,000-cubic yard contract for widening the highway all between Chef Menteur and Rigolets Bridges east of New Orleans. A description of the Manatee appears on page 12.



C. & E. M. Photo

Ned Morris, Superintendent for Robinson & Young of Baton Rouge, La.; Theo. T. Chenet, Resident Engineer; and Paul Ott, Inspector, for the Louisiana Highway Commission on the Calcasieu River Bridge approach fill near Lake Charles, La. See description of work on page 1.



LEFT, Cecil Ruby, San Antonio, Texas, contractor, used a fleet of fourteen Ford trucks with large dump bodies, and 8-yard dump-trailers pulled by Ford V-8 tractors for hauling dirt from an elevating grader outfit working in a wide borrow pit on a road widening project near Thorndale, Texas.

ABOVE, construction equipment turns aquatic in the excavation for the sea locks at Bonneville Dam. A Northwest shovel owned by General Construction Co. loading rock to one of the fleet of International motor trucks used by the hauling contractor, D. A. Whitley of Spokane, Washington. The sea locks of the Bonneville Dam are being excavated in solid rock to permit ocean-going vessels to pass around the dam and proceed some 50 miles up the Columbia River.



Photo, Courtesy, Compressed Air Magazine

To furnish the 36,500 tons of crushed rock base for the surfacing of its 10.25-mile section of the now-famous Sky Line Drive near Luray, Va., Sammons-Robertson Co., Inc., of Huntington, W. Va., operated this Diamond crushing and screening plant during the winter and stockpiled material for spreading in the spring.